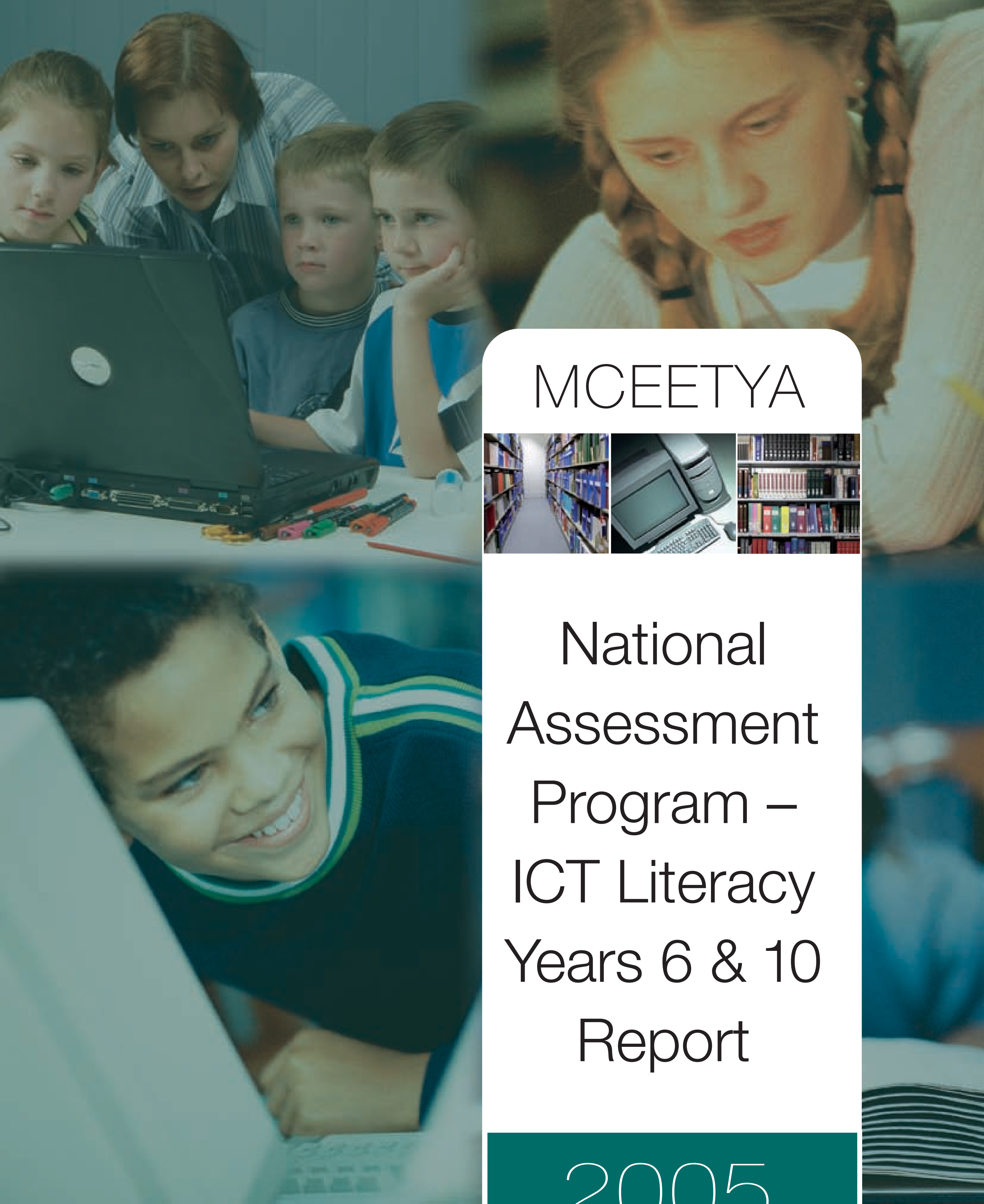

MCEETYA

National Assessment Program – ICT Literacy Years 6 & 10 Report

2005

Ministerial Council on Education,
Employment, Training and Youth Affairs

Ministerial Council on Education,
Employment, Training and Youth Affairs

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Employment, Training and Youth Affairs

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NATIONAL ASSESSMENT PROGRAM

ICT Literacy
Years 6 and 10 Report 2005

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Acknowledgements

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Listed below is the main review committee member for each jurisdiction and specialist area who participated in the Review Committee during the development and implementation of the National Assessment Program - ICT Literacy, 2005 sample assessment. The assistance of others who came to the Review Committee meetings is also acknowledged. The work of the committee made a valuable contribution to the success of the project.

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Foreword

When Australian students leave school, our community expects that they are confident and productive users of information and communication technologies (ICT) and understand the impact of ICT on society.

This *ICT Literacy Report* represents the findings from the first national assessment of the ICT literacy of Australian school students. The *ICT Literacy report* is the third published as part of the *National Assessment Program*, and follows the *2003 National Year 6 Science Report* and the *Civics and Citizenship Years 6 & 10 Report 2004*. The next national ICT assessment is due in 2008.

The assessment, conducted towards the end of 2005, established a single ICT literacy scale against which the achievements of students at Years 6 and 10 can be reported and proficiency levels linked to descriptions of student performance.

The report compares results by State and Territory. It also reports on achievement according to gender, socio-economic group, Indigenous status, language background and geographical location.

The commitment of principals, teachers and students at government, Catholic and independent schools around Australia through their participation in the 2005 assessment has provided a valuable evidence base of ICT literacy in Australian schools.

Particular thanks are due to the people responsible for developing and administering the assessments on behalf of MCEETYA – the Performance Measurement and Reporting Taskforce and its Benchmarking and Educational Measurement Unit.

This report will be of vital interest to everyone – teachers, educators, employers, parents and others – with a stake in how our young people are being equipped to use and understand ICT technology in the new century.

Rachel Hunter
Chair
Performance Measurement and Reporting Taskforce
July 2007

Executive Summary

Australia's national goals for schooling assert 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: Goal 1.6). The Australian National Assessment Program includes the systematic assessment of the extent to which this goal is being achieved through triennial sample surveys of students in Years 6 and 10.

This report is based on the assessment of ICT literacy conducted in October 2005. It describes the development of a computer-based tool for assessing ICT literacy among school students and the application of that tool with a nationally representative sample of approximately 7,400 students from Years 6 and 10 in nearly 520 Australian schools. The report describes the development, validation and refinement of a progress map that identifies a progression of ICT literacy. It describes the ICT literacy levels of Australian school students overall and for particular groups of students.

Definition of ICT Literacy

For the purpose of this assessment ICT literacy is 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).*

From the definition a conception of student progress in ICT was formulated in terms of three "strands": working with information; creating and sharing information; and using ICT responsibly.

Assessment Method

The assessment instrument was computer-based and was administered using sets of networked laptop computers delivered to each sampled school. The assessment instrument included simulated ICT screens that behaved the same as common application programs and authentic applications of real software to larger tasks so as to produce work for subsequent assessment. Requiring students to complete tasks in authentic contexts was fundamental to the design of the Australian national ICT Literacy assessment.

The assessment instrument consisted of seven discrete thematic modules. One module, the General Skills Test, included only simulation and multiple-choice assessment items. Six of the modules, the Hybrid Assessment Modules, contained conventional simulation, multiple-choice and constructed response items with live application software. All students first completed the General Skills Test and then two Hybrid Assessment Modules. This ensured that the assessment instrument accessed what was common to ICT literacy across a range of authentic contexts.

The assessment was completed by 3,746 Year 6 and 3,647 Year 10 students from 264 primary and 253 secondary schools across Australia. The sample was selected by cluster sampling methods to ensure that the results accurately represented the Australian population of Year 6 and Year 10 students.

ICT Literacy Scale

Item response modelling (the Rasch model) was used to analyse the pattern of student responses (which items and how many items they successfully completed). This process was the key to generating a single scale on which the items from each of the different assessment modules could be located and against which the students' achievement could be reported. A large number of students completed each of the modules and the rotational design ensured that every possible combination was adequately covered. The analyses also showed that the items formed one dimension and that the scale was reliable in the sense of being internally consistent (the person separation index was 0.93 on a possible range from zero to one).

The ICT literacy scale was fixed so that the mean score for Year 6 students was 400 and the standard deviation for Year 6 students was 100 points. The choice of these parameters meant that about two-thirds of the Year 6 students would have ICT literacy scores between 300 and 500 points. It follows from setting these scale points that for Year 10 the mean ICT literacy score was 550 and the standard deviation was 97.5. In other words there was a clear difference in the ICT literacy of students in Year 6 and Year 10.

ICT Literacy Profile

The items distributed across the ICT literacy scale were used to develop a progress map that could be interpreted in terms of the skills and understandings demonstrated by students in their responses to the items. In this case six proficiency levels were defined and descriptions were developed to characterise typical student performance at each level. The profile is shown in Table ES1 with the percentage of students in each proficiency level. The levels and the percentage in each level are used to summarise the performance of students overall, to compare performances across subgroups of students. These data are represented in Figure ES1.

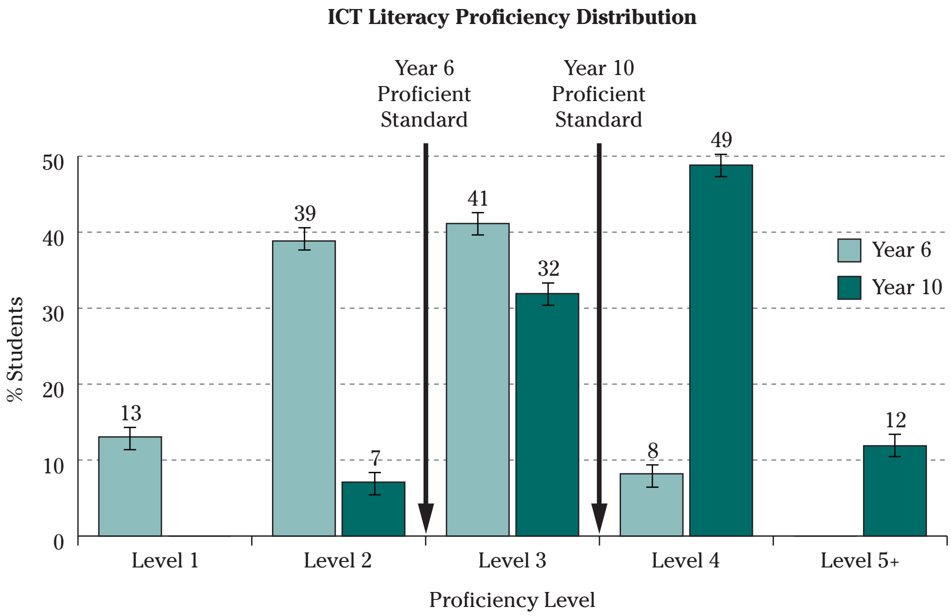


Figure ES1: Distribution of Year 6 and Year 10 Students over ICT Proficiency Levels

Table ES1: ICT Literacy Profiles for Year 6 and Year 10

Scale	Year 6	Level	Year 10
	0%	**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.	0.4%
750			
	0.1%	**Level 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.	11.9%
625			
	7.7%	**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.	48.9%
500			10p
	40.8%	**Level 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.	32.0%
375			6p
	38.8%	**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.	6.4%
250			
	12.6%	**Level 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.	0.4%

6p: Year 6 proficient standard
10p: Year 10 proficiient standard

The separation of Year 6 and Year 10 students is shown in TableES1. Only eight per cent of Year 6 students performed at Level 4 or above compared to 61 per cent of Year 10 students. In contrast 51 per cent of Year 6 students performed at Level 2 or below compared to seven per cent of Year 10 students.

Proficient Standards in ICT Literacy

In addition to deriving the ICT Literacy proficiency scale, proficient standards were established 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 standards were established as a result of two-day consultations with ICT education experts and representatives from all states and territories and all school sectors. The groups included currently practising teachers with specific ICT expertise, ICT curriculum experts and educational assessment experts.

The proficient standard for Year 6 was defined as the boundary between levels 2 and 3 or a score of 375 on the ICT literacy scale. Forty-nine 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".

The proficient standard for Year 10 was defined as the boundary between levels 3 and 4 or a score of 500 on the ICT literacy scale and 61 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".

Patterns of ICT Literacy

Australia's national goals for schooling assert that: students' outcomes from schooling should be free from the effects of negative forms of discrimination based on sex, language, culture and ethnicity, religion or disability; and of differences arising from students' socio-economic background or geographic location (MCEETYA, 1999: Goal 3.1).

ICT literacy was quite strongly associated with socioeconomic background. Approximately two-thirds (68%) of Year 6 students whose parents were "senior managers and professionals" attained the proficient standard compared to approximately one-third (32%) of students whose parents were in "unskilled manual, office and sales" occupations. There was a gap of 87 scale points between the mean for Year 6 students whose parents were classified as "senior managers and professionals" and the mean for students whose parents were classified as "unskilled manual, office and sales". For Year 10 students the corresponding gap in mean scale scores was 65 points. Three-quarters (75%) of Year 10 students whose parents were "senior managers and professionals" attained the proficient standard compared to just less than half (49%) of students whose parents were in "unskilled manual, office and sales" occupations.

Indigenous status is also associated with ICT literacy. The percentages of non-Indigenous students attaining the proficient standard for each Year were somewhat greater than the percentages of Indigenous students. In Year 6 the comparison is 50 per cent compared to 30 per cent. In Year 10 the comparison is 62 per cent compared to 35 per cent. The net differences in scale scores between Indigenous and non-Indigenous students are 36 scale points at Year 6 and 50 scale points at Year 10, after allowance is made for the associated influence of socioeconomic group and geographic location. This is a smaller difference than has been observed in the national assessment of Civics and Citizenship and in PISA and TIMSS where the scales can be compared.

ICT literacy was lower for students from remote locations than for their peers from metropolitan locations. In Year 6 52 per cent of students from metropolitan locations attained the proficient standard compared to 33 per cent of students from remote locations. The corresponding figures for Year 10 were 63 per cent and 46 per cent. Those differences remained after allowing for the influence of other associated factors.

There was no statistically significant difference between the sexes in the percentage attaining the proficient standard at either Year 6 (the magnitude of the difference was seven percentage points in favour of females) or Year 10. There was no difference in ICT literacy associated with language background.

At Year 6, when the comparisons among jurisdictions including confidence intervals are considered, there appear to be three groups of jurisdictions in terms of ICT literacy. The percentages attaining the proficient standard are shown in Table ES2. In Year 6, Victorian students, 58 per cent of whom attained the proficient standard performed just significantly above the Australian average of 49 per cent. There was no significant difference between the national performance and that of students in Tasmania, New South Wales and South Australia. In Queensland and Western Australia the proportion of students attaining the proficiency level was significantly lower (between 38 and 40 per cent) than the Australian average.

For the Australian Capital Territory and the Northern Territory the sample sizes limit our certainty about the differences even though they are relatively large in magnitude. The percentage of students attaining the proficient standard in the Australian Capital Territory was not significantly different from the national average (although the difference was 10 percentage points). For the Northern Territory the percentage of students attaining the proficient standard was not significantly different from the national average (although the gap was 13 percentage points). These differences among States and Territories cannot be fully accounted for by differences in social and demographic characteristics.

Table ES2: Percentages of Students from Each State and Territory attaining the Proficient Standard

	Year 6		Year 10	
	%	Confidence Interval	%	Confidence Interval
New South Wales	50.5	±6.6	61.1	±7.6
Victoria	57.9	±6.3	66.5	±4.8
Queensland	37.7	±5.3	59.5	±7.4
South Australia	51.7	±5.0	61.4	±5.4
Western Australia	39.6	±5.4	55.8	±6.1
Tasmania	48.9	±9.0	56.4	±6.4
Northern Territory	36.0	±10.0	48.6	±13.2
Australian Capital Territory	58.4	±12.5	65.5	±11.4
Australia	48.6	±3.0	61.2	±3.1

For Year 10 there was no significant difference between the percentage of students attaining the proficient standard in any jurisdiction and the Australian average. The range was from 67 per cent of students in Victoria attaining the Year 10 proficient standard to 49 per cent in the Northern Territory and 56 per cent in Western Australia but these differences were not statistically significant.

Familiarity with ICT Literacy

There were differences evident in the extent to which students in Years 6 and 10 had the opportunity to become familiar with computers. Fifty-one per cent of Year 6 students whose parents had either “skilled or unskilled trades and office” occupations had more than five years experience of using computers compared to 59 per cent of those students whose parental occupations were “professional or managerial”. Among Year 10 students the corresponding percentages were 61 per cent and 68 per cent. There were similar differences in home computer usage between socioeconomic groups.

There were quite large differences in the reported frequency of school computer use among Year 10 students. The results in Table ES3 indicate a substantial variation in usage of computers at school by Year 10 students from the highest using jurisdictions (Tasmania, South Australia and Victoria) to the lowest (New South Wales). There was much less variation among jurisdictions at Year 6 with the only statistically significant difference being between the highest using State (South Australia) and the lowest using State (New South Wales).

Table ES3: Estimated Frequency of Use of Computers at School by Year 10 Students

	Mean days per month	Confidence Interval
New South Wales	7.0	±0.6
Victoria	11.6	±1.1
Queensland	9.6	±0.8
South Australia	12.0	±0.8
Western Australia	9.6	±1.0
Tasmania	12.7	±0.6
Northern Territory	11.0	±2.4
Australian Capital Territory	9.2	±0.8

Familiarity with ICT and student attitudes to using computers is associated with ICT literacy scores and contributes to part, but not all, of the variations in ICT literacy among students.

Students vary considerably in the computer applications that they use. Those patterns of use differ between Year 6 and Year 10, and between males and females. 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. However, there was much less frequent use of applications that involved creating, analysing or transforming information. The lack of use of these types of application appears to be reflected in the aspects of ICT literacy that were less successfully completed by students.

Conclusion

One should not assume that students are uniformly becoming adept because they use ICT so widely in their daily lives. The results of the assessment survey suggest that students use ICT in a relatively limited way and this is reflected in the overall level of ICT literacy. Communication with peers and using the internet to look up information are frequent applications but there is much less frequent use of applications that involve creating, analysing or transforming information. There are substantial differences between Year 6 and Year 10 suggesting that considerable growth in ICT proficiency takes place over these four years. Within each Year level there are differences associated with socioeconomic background, Indigenous status and remote geographic locations (compared to metropolitan locations).

Overall, 49 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-one 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”.

Chapter 1
Introduction to the National ICT Literacy Sample Assessment, 2005

Recent decades have witnessed the development and pervasive implementation of information and communication technologies (ICT) throughout society. This development has found expression in the term "the information society". There is consensus that the exchange of information and knowledge through ICT is a feature of modern societies. ICT provides the tools for the creation, collection, storage and use of knowledge as well for communication and collaboration (Kozma, 2003). The development of ICT has changed the environment in which students develop skills for life, the basis of many occupations and the way a number of social transactions take place. ICT literacy has become important for life in modern society and its assessment has become a component monitoring student achievement in many educational systems.

ICT Literacy and School Education

Australia's national goals for schooling assert 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: Goal 1.6).*

There is similar recognition of the importance of ICT literacy in other countries that have recognised the importance of education and training in ICT so that citizens can access information and participate in transactions through these technologies. In the United Kingdom, the Qualifications and Curriculum Authority asserts that ICT "is an essential skill for life and enables learners to participate in a rapidly changing world" (QCA, 2007) and ICT is compulsory within the National Curriculum (http://www.nc.uk.net). In the United States, the National Literacy Act includes the ability to use computers in its definition of literacy and many states have programs to monitor student ICT literacy (Crawford & Toyama, 2002).

In some senses ICT literacy in school education is analogous to reading literacy in that it is both an end and a means. At school young people learn to use ICT and they use ICT to learn. In schools ICT is used as the basis for instructional delivery systems to increase skills and knowledge in other learning areas; as a tool for accessing resources, communicating, analysing or conducting simulations. ICT is sometimes seen as providing foundations for changing teaching and learning processes. However, ICT is also used so that students can develop ICT skills and knowledge and understand the role of ICT in learning, work and society.

Although this report is about young people learning to use ICT that purpose should be seen in a wider context. The Ministerial Council for Education Training and Youth Affairs (MCEETYA) through its ICT in Schools Taskforce has published an overarching national vision of schools using ICT to improve learning, teaching and administration: *Contemporary Learning: Learning in an Online World* (MCEETYA, 2005a). This builds on the changes that have occurred in the use of information and communication technologies (ICT) in schools in the years since the publication of *Learning in an Online World: the School Education Action Plan for the Information Economy* (MCEETYA: 2000).

Evaluating ICT literacy

Australian education authorities, through the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA), are committed to assess the extent to which the goal of ICT literacy, and other national goals, is being achieved. The *Performance Measurement and Reporting Taskforce* (PMRT) of MCEETYA is responsible for the assessment process. Assessments of literacy and numeracy are conducted annually using the full population of students at Years 3, 5, 7 and (shortly) 9. In science, civics and citizenship and ICT literacy assessments are conducted using sample surveys of students in Year 6 and Year 10 every three years. This is a report of the first of the sample surveys of ICT literacy conducted in October 2005.

This report outlines the development of a computer-based tool for assessing ICT literacy among school students and the application of that tool with a nationally representative sample of 7,400 students from Year 6 and Year 10 in Australian schools. The report describes the development, validation and refinement of a progress map that identifies a progression of ICT literacy. It describes the ICT literacy levels of Australian school students overall and for particular groups of students.

What is ICT literacy

Definition

For the purpose of this assessment ICT literacy is 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, 2005b).*

The definition draws 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) and is consistent with an emerging consensus about ICT literacy (Kelly & Haber, 2006). Definitions of ICT literacy differ in the extent to which they emphasise computer skills and system knowledge, applications for analysis and information processing or communication (e.g. as new literacies or multi-literacies[1]). They also vary in the extent to which they see ICT literacy as a distinct attribute rather than embedded in the context of other domains (such as reading or science). The MCEETYA definition that is the basis for this assessment sees ICT literacy as a distinct attribute but as one that emphasises real-world application to relatively high order processes in a range of contexts.

Scope

Although ICT can be broadly defined to include a range of tools and systems this assessment focuses primarily on the use of computers rather than other forms of ICT. There are three reasons for adopting this focus. First, although one can envisage computer literacy as a construct, one cannot be sure that the same construct would fit a range of different technologies. It is not clear that using mobile phones for text messaging is part of the same dimension as using a computer program to search for or transform information. Secondly, one could reasonably expect all students to have had deliberate and considered exposure to computer technology in schools. Other forms of ICT are less closely connected to what happens in school and less clearly the business of schools. The third is that as a first step in a new field it was important to contain the scope so as to make the assessment manageable. Nevertheless,

1 See, for example, Mioduser, Nachmias and Forkosh-Baruch (2007)

the ICT literacy assessment framework acknowledges that the cornerstones of ICT literacy are the importance of knowledge and skill regarding contemporary technology and the fundamental understandings and aptitudes towards dealing with information and learning about new technology.

Progress in ICT literacy

Any assessment is underpinned by a concept of progress in the area being assessed. This assessment of ICT literacy is based on a hierarchy of what students typically know and can do. Progress in ICT literacy is articulated in the assessment framework as a progress map that describes six levels of increasing complexity and sophistication in using ICT. A progress map is always a draft to be developed and refined as a result of the empirical evidence. For convenience, students' skills and understandings are grouped and described in levels of proficiency. Each level 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. The draft ICT Literacy progress was based on three "strands":

- working with information;
- creating and sharing information; and
- 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.

Approach to the Assessment of ICT literacy

ICT assessment

Internationally there have been four main approaches to the assessment of ICT literacy.

- Pen and paper methods are used and students are asked about ICT without any use of the tools themselves.
- Computer technology is used to deliver questions in traditional forms or where computer technology is used only to present stimulus material but the questions are multiple choice or constructed response questions that do not require any use of the technology other than to record an answer.
- Simulated ICT screens displayed on a computer so that students are required to take an action in response to a question and their response is recorded. These are typically single tasks (such as copying, pasting, using a web browser) but the screens need to allow for all possible "correct" responses to be recognised. The responses can be automatically scored.
- Students are required to use authentic applications and save the products of their work for subsequent assessment by assessors. This approach typically involves using multiple applications concurrently (which is what one typically does with computer software) to perform larger (but specified) tasks and provides the best method of assessing the higher levels of ICT literacy.
- Requiring students to complete authentic tasks in authentic contexts was seen as fundamental to the design of the Australian National ICT Literacy assessment so the fourth approach was incorporated along with the third approach. The inclusion of communication in the ICT construct is recognition of the overwhelmingly prevalent context in which students develop and demonstrate computer knowledge and skills. More generally, it can be noted that ICT holds considerable promise for expanding and enriching assessment tools so that they can be based on authentic tasks (Pellegrino, Chudowosky & Glaser, 2001).

The assessment instrument

One of the challenges for authentic assessments is that of delivery on a large scale. Traditional assessments that can be given consistently to large numbers of test takers over a large geographic area such as paper or online surveys and – in some cases – automated skills-based assessments can provide useful information. However, they are limited in the extent to which they can be used to analyse complex work products or behaviours such as a student's ability to evaluate and integrate information. Assessment techniques that provide for analysing higher-level abilities (involving rubric-scored portfolios or classroom observations) have proven to be difficult to administer beyond classroom level because of the resources and the problems of ensuring consistent assessment work products and observations.

This assessment instrument combined multiple item types within a single, consistently administered assessment. Within each ICT assessment module students were asked multiple-choice questions to assess knowledge, to perform specific functions within simulations of software products to assess skill with applications such as Microsoft Windows, Word and Internet Explorer, to provide constructed responses to specific questions and create work products using live applications. The work products, created under controlled, consistent conditions for every student, were evaluated using standardised rubrics by trained assessors.

Assessment modules and items

The assessment instrument consists of seven discrete thematic modules. One module, the General Skills Test, includes only simulation and multiple-choice assessment items. Six of the modules, the Hybrid Assessment Modules (HAMs), integrate conventional simulation, multiple-choice and constructed response items with live application software. All students first completed the General Skills Test and then two HAMs. One reason for conducting the assessment with a number of HAMs is to ensure that the assessment instrument accesses what is common to the ICT construct across a sufficient breadth of authentic contexts.

The General Skills Test was created to assess students' fundamental computer skills and knowledge and the item formats used enabled all items to be automatically scored by the system. Since all students completed the General Skills Test, data from these items could be used as universal links in estimating student achievement and test item difficulty on the same scales. The General Skills Test also served as a gatepost test, by enabling students with the least proficiency to be automatically allocated the two easiest HAMs.

The HAMs followed a basic structure in which the simulation, multiple-choice and short-constructed response items were followed by a single large task using at least one live software application. The audience and software related communicative context were specified to the students as part of the communicative purpose of the large task.

Administration

Computer-based assessment

The assessment was required to be computer based and it was important that the computer-based assessment was administered on an environment that was uniform for all students on computers that functioned reliably. For both the field trial and the main survey the ICT literacy assessment was administered using sets of six networked laptop computers (five were for students and one was for the test administrator) with all necessary software installed. Test administrators travelled to each school with the networked computers to manage the process.

Field trial

A field trial was conducted in April 2005. Assessments were obtained from 617 students in 66 schools (the intention was to sample ten students in each school) from four States. Students completed three modules each. There were 275 respondents to the General Skills Test and an average of 160 respondents to each HAM. In the field trial there were 332 Year 6 students (35 schools) and 285 Year 10 students (31 schools). Overall, 53 per cent were female, 3 per cent were Indigenous, and 27% had a parent who spoke a language other than English at home. Some 84% had used a computer for three years or more, 54% said they used a computer every day at home (and 84% used a computer every week), 13% said they used a computer every day at school (and 67% every week), and more than 90% used a windows-based computer either solely or as well as a Macintosh computer at home. The most frequent uses of computers were using the Internet to look up information, playing games and doing word processing. The least frequent uses of computers were for spreadsheets, mathematics applications, language or other learning programs, and programming.

Main survey

For the main survey, in each school the assessment process involved five students in each of three sessions. In total there were 21 networks (or mini-labs) taken into schools by trained administrators. Although the logistics of this operation were challenging it was successfully implemented. At the end of each day the files of student responses were burned to CD-ROMs and despatched to ACER where they were compiled in the data file for assessment and analysis. Greater detail is provided in Appendix 1.

The sample was a two-stage (probability proportional to size) cluster design to ensure that each eligible student had an equal chance of being selected in the sample. Identical procedures were followed for the Year 6 and the Year 10 samples. In the first stage schools in each stratum were selected, from within the strata of State or Territory and sector, with a probability proportional to the number of students in the relevant Year level enrolled at that school. In the second stage students (other than those students defined as excluded under PMRT protocols) were selected at random. This involved obtaining from the school a list of all eligible students in the Year level and selecting a random sample from the list. Replacement students were selected in case one or more of the students declined to participate or is absent on the day of testing.

The sample design was for a sample of 7,800 students (3,900 at each of Year 6 and Year 10) from 520 schools (260 at each of Year 6 and Year 10). The achieved sample totalled 3,746 Year 6 and 3,647 Year 10 students from 264 primary and 253 secondary schools across Australia. The participation rates were 96 per cent at Year 6 and 93 per cent at Year 10. Greater detail about the sample is provided in Appendix 1. The survey took place over a two-month period from 12 September to 14 November 2005.

Data management

Two main forms of assessment data were generated by students using the assessment tool. The first were those based on student responses to tasks that are either correct or not correct (including the possibility that there could be several correct ways of responding to a task) or responses to multiple choice items. These were scored automatically by the system and stored directly in a student-scores database. The second were those where a student wrote a short constructed response or produced an artefact that is compiled for scoring by trained assessors. The short constructed responses and artefacts were scored by the assessors using detailed rubrics and an on-line marking system.

Each automatically scored and short constructed response item typically addressed one specific aspect of the ICT literacy framework. Responses to items were therefore scored according to the degree to which they demonstrated achievement of the relevant aspect. In some cases, a partial credit scoring model was used to deal with responses that were indicative of qualitatively different degrees of achievement of an aspect.

The student artefacts typically provided evidence of achievement across a range of aspects of the ICT literacy framework. The artefacts were therefore scored using a rubric of criteria in which each criterion related to discrete aspects of the framework. Broadly the assessment criteria for the artefacts could be classified as relating to either the substantive properties of the student work, or the students' use of the available software features. In each case the assessment criteria were couched and considered in terms of the overall communicative purpose of the artefact.

The on-line marking system provided for student artefacts to be displayed on a screen and scores to be recorded and included in the student scores database with the automatically generated scores. Raters worked as a team with four supervisors second-marking a random 10% of all scored student work by all raters. Overall the correlation between rater and supervisor scores was 0.86.

Once the student scores database was assembled, analysis of responses was undertaken to establish the psychometric properties of the scales. Individual analyses were conducted of the full data set, each strand, the General Skills Test (GST) module and each module (because the modules are not intended to be of equal difficulty). The GST was given special attention because this module was common to all students and was used as a basis for assigning students to tasks. Analyses were also conducted to test for differential item functioning by sex and Year level. The analysis also tested the links (common items) between Year 6 and Year 10. Subsequent analysis involved a standards setting consultation to establish the level that was deemed a proficient standard. Student scores on the ICT Literacy scale were analysed in relation to student characteristics and the State or Territory from which they came.

Structure of This Report

This chapter of the report provides an introduction to the national sample assessment in ICT literacy. It outlines some general issues associated with ICT in schools, the assessment of ICT literacy and the way in which the assessment was conducted.

Chapter 2 is concerned with the assessment framework that guided the project and the assessment instrument that was used. It describes the elements of ICT literacy that constitute the framework and the initial or theoretical progress map that guided the development of the assessment instrument. It also provides some detail about the modular structure (the general skills test and the hybrid modules) of the assessment instrument and the types of items that provided the content of the modules. The chapter also outlines the content of the student questionnaire that was administered (on computer) at the same time as the assessment instrument.

Chapter 3 describes the ICT literacy of Australian school students. It is built around an analysis of item and scale statistics and provides a description of the ICT literacy scale. The ICT literacy scale is described in terms of scale statistics and a set of proficiency bands with descriptors of each band derived from an interpretation of the nature of the items that fall within each band. Items are mapped to levels on the scale and the described proficiency bands characterise the empirically validated progress map. Chapter 3 compares the proficiency of Year 6 and Year 10 students on the ICT literacy scale and also compares the performance of students at each of those Year levels with the proficient standard that was established through a process of structured consultation with experts in the field.

Chapter 4 is concerned with differences in ICT literacy among groups of students. It compares the performance of males and females, students from the different Sates and Territories and students from specified social groups. These social groups are based on socio-economic status, language background, Indigenous status, and geographic location.

Chapter 5 uses data from the student survey to examine students' experience of using computers and the relationship between familiarity with computing and performance on the ICT literacy scale. It concludes with a multivariate analysis of the survey data to determine the factors that are most strongly related to ICT literacy.

Chapter 6 provides some inferences from these data on ICT literacy. It provides an overview of student performance at Year 6 and Year 10 and discusses some implications of the differences between Year 6 and Year 10 and the differences in ICT literacy among groups of students.

Chapter 2
Assessing ICT Literacy

The results of any assessment of ICT literacy depend upon the ways in which the concept is defined, the assessment tools that are derived from that conception and the way in which the assessment is administered. In this chapter the assessment domain that framed the ICT literacy assessment is described including the definition adopted, the elements envisaged as comprising ICT literacy (sketching the field) and the theory of progress in ICT literacy (that outlines a vision of what it means to become more ICT literate). The chapter also describes the assessment tool that was developed to be administered on computers using tasks that embodied as much authenticity as possible. In other words the assessment tool was developed so as to replicate how people used computers when approaching real tasks. Results from any assessment need to be interpreted in terms of how the assessment was delivered. The ICT literacy framework and its subsequent operationalisation as the assessment instruments are described in detail in this chapter. In addition the chapter describes the sample of nearly 7,400 students, from 517 schools, that completed the ICT literacy assessment. The sample was selected to be representative of the Australian population of Year 6 and Year 10 students so that valid estimates of ICT literacy could be derived for the nation, for States and Territories and for designated groups of students.

Assessment Domain for ICT Literacy

Background

An expert committee was asked to create an assessment domain for ICT literacy that could be used to frame this inaugural and the ongoing three-yearly national sample assessments of ICT literacy. The assessment domain is the result of an 'extensive literature review and examination of international and national surveys, panels and frameworks' (MCEETYA, 2005b). The assessment domain includes:

- the definition of ICT literacy;
- a description of the ICT literacy domain, strands and the progress map;
- the types of items that will be used in ICT literacy assessment; and
- how the results from the assessments will be reported (MCEETYA, 2005b).

Defining ICT literacy

In July 2001, MCEETYA agreed to define ICT as 'technologies used for accessing, gathering, manipulation and presentation or communication of information' (MCEETYA, 2005b). For the purpose of this, the first national sample assessment of ICT literacy, it was decided that the assessment of ICT literacy would focus on students' use of computer tools. For the purpose of the National Assessment Program, ICT literacy is 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, 2005b).*

Key processes of ICT literacy

The assessment domain describes ICT literacy as comprising the following six processes:

1. Accessing information - identifying the information needed 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 about making 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 with others - exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium; and

6. Using ICT appropriately - making critical, reflective and strategic ICT decisions and about using ICT responsibly by considering social, legal and ethical issues.

Draft ICT literacy progress map

The assessment domain included a draft progress map of student achievement in ICT literacy. The draft progress map, shown in Figure 2.1, describes the assumed 'typical' growth of students' ICT knowledge, understandings and skills. The draft progress map has been a key reference for both the development of the assessment items and the consequent construction of the ICTL scale. The progress of student achievement in the ICT Literacy processes can only be demonstrated with consideration of the communicative context, purpose and consequences of the medium. As such, the ICT Literacy progress map is based on three strands:

- Strand A – Working with information
- Strand B – Creating and sharing information
- Strand C – Using ICT responsibly

In each of the strands there are six proficiency levels hypothesised. These are not proposed as discrete steps that are discontinuous but are proposed as a means of representing progress within each strand. Table 2.1 includes the three strands and the six levels within each strand. It is proposed as a representation of the field and does not assume that the strands are empirically distinct. The assessment instrument is designed so that approximately 80 per cent of the total assessment content is distributed evenly between Strands A and B and the remaining 20 per cent to Strand C.

In *Working with Information*, students progress from using key words to retrieve information from a specified source, through identifying search questions, terms and suitable sources, to using a range of specialized 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 specialized 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 recognizing 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.

Table 2.1: Information and Communication Technology Literacy Draft 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.

	Strand A: Working with Information	Strand B: Creating and Sharing information	Strand C: Using ICT responsibly
	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.	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.	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.

The ICT Literacy Assessment Instrument

Platform

The assessment was required to be computer based and it was important that the computer-based assessment was administered on an environment that was uniform for all students on computers that functioned reliably. For both the field trial and the main survey the ICT literacy assessment was administered using sets of six networked laptop computers (five were for students and one was for the test administrator) using MS Windows operating systems and with all necessary software installed.

The software installed on each computer 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 for students who demonstrated minimum competence on the initial module) and collected student responses to the survey questions[2].

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 can 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 environment as seen by students is represented in Figure 2.1.

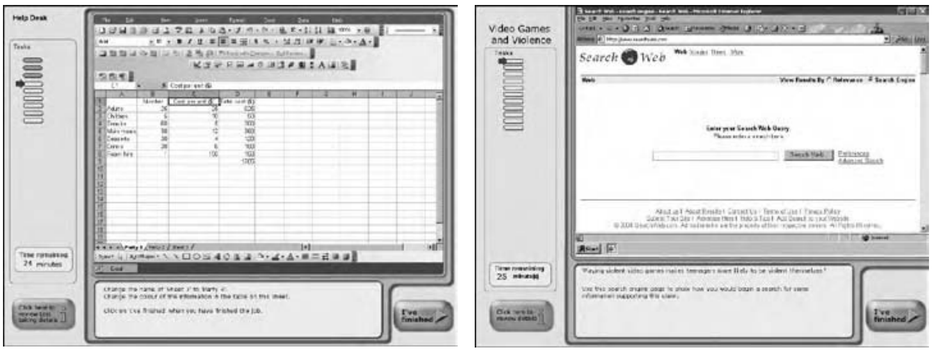


Figure 2.1: On-Screen Environment for ICT Literacy Assessment 2005

2 The assessment instrument package integrated software from four different providers on a Microsoft Windows XP platform. The two key components of the software package were developed by First Advantage Assessment Solutions (formerly SkillCheck) (Boston, MA) and SoNet Software (Melbourne, Australia). The First Advantage system provided the test management software responsible for delivering the assessment items and capturing student data. It also provided the simulation, short constructed response and multiple choice item platforms. The SoNet software enabled live software applications (such as Microsoft Word) to be run within the global assessment environment and for the resultant student products to be saved for later assessment.

So as to ensure the smooth operation of the system and to assure data quality, test administrators travelled to each school with the networked computers to manage the process. The assessment was administered to groups of five students in each of three testing sessions during the school day.

Structure of the instrument

The ICT assessment instrument was designed to model students' typical 'real world' use of ICT. Task authenticity was included in the ICT assessment instrument in two main ways. Firstly, students completed all tasks on computer using a seamless combination of simulated and live software applications. Secondly, 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. 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.

Assessment item types

The elements of the integrated software systems are each suited to accessing different aspects of the ICT assessment construct. The conventional simulation, short constructed response and multiple choice item platforms were suited to assessing ICT knowledge and discrete skills and capturing students' analytical responses to assessment stimulus materials such as information on websites. The live software integrated in the assessment package enables students to complete a range of authentic ICT products.

There were five distinct types of assessment items or tasks in the ICT literacy assessment instrument. The item type used for each item was determined by the substance of the item and the capacity of the available software to manage the full functionality of the item. It was neither necessary nor possible to predetermine the proportion of item types within each module or across the assessment instrument as a whole. The different types of items access different types of student achievement information across the three ICT literacy strands. The item types, the type of information they access and their technical properties are summarised in Table 2.2.

Table 2.2: Summary of ICT Literacy Assessment Task Types, Information Accessed and Technical Properties

Item/Task Types	Information Accessed	Software Type and Response Protocol	Scoring
Multiple-choice questions (MCQ)	Knowledge and understandings of ICT literacy across the three strands	Static information screen with MCQ response section; student responses recorded in individual student data-files	Automated
Simple software skills performance tasks	Capacity to complete simple (one or two step) software and system management tasks (mainly strands A and B)	Simulation; student responses recorded in individual student data-files	Automated
Short constructed responses	Knowledge and understandings of ICT literacy across the three strands	Static information screen with constructed response field; student responses saved as text fields in individual student data files	Manual – human scored
Complex software skills performance tasks	Capacity to complete complex (multi-stage) software tasks (mainly strands A and B)	Live single application; student responses saved as uniquely labelled software application files (e.g. '*.doc, *.xls)	Manual – human scored
Large tasks	Combined knowledge and understandings of ICT literacy across the three strands with the capacity to create complex information products across a range of software types	Simultaneously available live application files; student responses saved as uniquely labelled software application files (e.g. '*.doc, *.xls)	Manual – human scored against multiple assessment criteria

The assessment modules

The assessment instrument consisted of seven discrete thematic modules. One module, the General Skills Test, included only simple software skills performance and multiple-choice assessment items. The General Skills Test was completed by all students. Six of the modules, the Hybrid Assessment Modules (HAMs) integrated all item types.

All students first completed the General Skills Test and then two HAMs. One reason for conducting the assessment with a number of HAMs is to ensure that the assessment instrument accesses the content suggested by the draft progress map across a sufficient breadth of authentic contexts. Figure 2.2 shows the workflow from registration through assessment to completion.

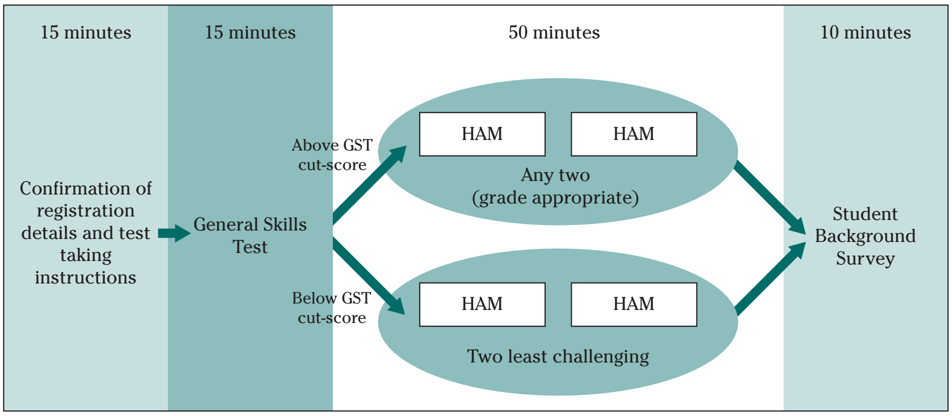


Figure 2.2: Workflow through the ICT literacy assessment

The General Skills Test

The General Skills Test serves two main purposes in the assessment instrument. First, as all students completed the General Skills Test, data from these items can be used as universal links in estimating student achievement and test item difficulty on the same scale. Second, the General Skills Test is designed to be a gatepost test of basic computer proficiency. The content of the General Skills Test was created to assess students' fundamental computer skills and knowledge and the item formats used enabled all items to be automatically scored. A cut-score on the General Skills Test was established using data from the field trial. Students achieving less than the cut-score were deemed to have insufficient ICT capacity to cope with the demands of the more difficult HAMs. These students were automatically allocated the two easiest HAMs.

The Hybrid Assessment Modules

Students who demonstrated at least basic proficiency on the General Skills Test were randomly allocated any two Grade level appropriate HAMs. In the final survey, approximately 90 per cent of Year 6 and 99 per cent of Year 10 students demonstrated basic proficiency on the General Skills Test.

Each HAM had a single unifying theme. Five of the six HAMs followed a basic structure in which the software skills performance, multiple-choice and short-constructed response items form the lead up to a single large task using at least one live software application[3]. Typically the lead-up tasks require students to: manage files; perform simple software functions (such as inserting pictures into files); search for information; collect and collate information; evaluate and analyse information; and perform some simple reshaping of information (such as drawing a chart to represent numerical data). The large tasks that provide the global purpose of five of the six HAMs are then completed using live software. When completing the large tasks, students typically need to select, assimilate

3 The module entitled "help desk" involved students moving back and forth between different types of task.

and synthesise the information they have been working with in the lead-up tasks and reframe the information to fulfil a specified communicative purpose. The audience and software related communicative context are specified to the students as part of the communicative purpose of each large task. Students spent between 40 per cent and 50 per cent of the time allocated for the module on the large task. The modules with their associated large tasks are shown in Table 2.3.

Table 2.3: Hybrid Assessment Modules and Large Tasks

Module	Large task
Flag Design (Year 6)	Students use purpose-built previously unseen flag design graphics software to create a flag.
Photo Album (Year 6 & 10)	Students use unseen photo album software to create a photo album to convince their cousin to come on holiday with them.
DVD Day (Year 6 & 10)	Students navigate a closed web environment to find information and complete a report template.
Conservation Project (Year 6 & 10)	Students navigate a closed web environment and use information provided in a spreadsheet to complete a report to the Principal using Word.
Video Games and Violence (Year 10)	Students use information provided as text and empirical data to create a PowerPoint presentation for their class.
Help Desk (Year 6 & 10)	Students play the role of providing general advice on a community Help Desk and complete some formatting tasks in Word, PowerPoint and Excel.

Four of the six HAMs were undertaken by both Year 6 and Year 10 students of all abilities, one was undertaken by Year 10 students only. One HAM, Flag Design, was taken by Year 6 students of all abilities and only by Year 10 students who demonstrated below basic proficiency on the General Skills Test.

Student Background Questionnaire

The student background questionnaire consisted of questions concerned with students' access to, experience and use of computer technology, attitudes to computers and background characteristics. Questions about access, experience and attitudes were included specifically in this assessment of ICT literacy so as to be able to interpret better patterns of performance. Questions about background characteristics were included so as to be able to report the distribution of ICT literacy across the student population.

The questions about access to, experience of and use of computer technology were based on questions asked in the computer familiarity section of the PISA 2003 student survey and were concerned with:

- the length of time for which students had been using computers;
- the types of computer (windows, apple and other) used at school, home and other places;

- the frequency with which students used a computer in each of these locations;
- the frequency with which students used a computer for specified education-related functions (look up information on the internet, word processing spreadsheets, mathematics, language or other learning programs on a computer, programming); and
- the frequency with which students used a computer for specified entertainment-related functions (downloading games or music, playing games, using drawing, painting or graphics programs, email or "chatting", listening to music or watching DVDs).

The questions about attitudes asked students how important it was to them to work with a computer, whether working with a computer was fun, how interested they were in using computers and whether they lost track of time when working with a computer. They were also adapted from the PISA survey of computer familiarity.

The questions about background characteristics were intended to identify groups of interest and followed the format used in other sample surveys and consistent with the PMRT Data Implementation Manual. The questions were asked in formats for presentation and response by computer utilising checking of answer boxes, drop-down menus and text boxes for written responses to be coded later. The background questions asked about the sex of the respondent, the postcode of the student's permanent home address and the name of the location (so as to code geographic location), age (in years and months), Indigenous status, country of birth, parental occupation, parental education and language spoken at home.

Sample

Sample design

The sampling procedure followed the cluster sampling procedures established for national sample surveys conducted by the Performance Measurement and Reporting Taskforce. Cluster sampling is cost-effective because a larger 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.

In the first stage schools are 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. Within this process the list of schools is explicitly stratified by location and sector and implicitly listed in postcode order to ensure that the sample was representative. A small number of schools was excluded from the selection process[4]. The number of schools from each of the mainland States and Territories 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, 15 students were selected at random from a school-provided list of all eligible students from the Year level[5]. At the same time a list of replacement students was selected in case one or more of the students declines to participate or is absent on the day of testing. By selecting students at random from the Year level, and by selecting only 15 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[6].

The total achieved sample for the survey consisted of 7,373 students of which 3,746 were from Year 6 and 3,627 were from Year 10. Table 2.4 records the distribution of the sample across the States and Territories for each Year level.

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

	Year 6		Year 10	
	Schools	Students	Schools	Students
New South Wales	38	534	39	541
Victoria	40	575	39	593
Queensland	41	574	39	562
South Australia	41	591	40	581
Western Australia	41	570	40	557
Tasmania	31	447	30	428
Northern Territory	16	231	11	162
Australian Capital Territory	16	224	15	203
Total Sample	264	3746	253	3627

4 School exclusions are categorised as very remote schools; schools with fewer than five students at the Year level, schools for students with intellectual disabilities or migrant language centres. School exclusions amounted to fewer than two per cent of schools at Year 6 and less than one per cent of schools at Year 10. In Year 10 no jurisdiction had more than three per cent of its schools in the excluded category. At Year 6, 25 per cent of listed Northern Territory schools were excluded on the basis of size and very remote location but this represented a small percentage of students.

5 Certain students are defined as excluded under PMRT protocols (e.g. students with physical or intellectual disabilities, or limited language skills such that they are unable to participate in the assessment).

6 Technically this is known as the "design effect". It arises because students tend to be grouped in schools and classes with other students who are similar to themselves and reduces the statistical power of the sample.

Table 2.5: Distribution of Weighted Sample Characteristics

	Year 6		Year 10	
	%	Valid %	%	Valid %
Student Sex				
Boy	50.9	51.0	52.1	52.2
Girl	48.9	49.0	47.6	47.8
Total	99.9	100.0	99.7	100.0
Missing	0.1		0.3	
Parental occupation				
Senior managers & professionals	13.5	14.4	16.9	17.9
Other managers associate professionals	29.3	31.2	36.9	39.1
Skilled trades, clerical & sales	27.3	29.1	25.5	27.0
Unskilled manual, office & sales	23.7	25.3	15.0	15.9
Total valid responses	93.7	100.0	94.3	100.0
Not in paid work for 12 months	3.0		1.9	
Missing	3.3		3.9	
Indigenous Status				
Non Aboriginal or Torres Strait Islander	92.1	93.5	94.8	96.9
Aboriginal or Torres Strait Islander	6.4	6.5	3.0	3.1
Total	98.5	100.0	97.8	100.0
Missing	1.5		2.2	
Language at home				
English	73.7	74.3	72.3	73.7
Other than English	25.4	25.7	25.8	26.3
Total	99.1	100.0	98.1	100.0
Missing	0.9		1.9	
Main Language - Country of birth				
English (including Australia)	93.7	94.5	89.5	91.3
Other than English	5.4	5.5	8.5	8.7
Total	99.1	100.0	98.1	100.0
Missing	0.9		1.9	
Geographic location				
Metropolitan	66.9	68.0	69.7	71.6
Provincial	30.0	30.5	25.7	26.4
Remote	1.4	1.4	1.9	1.9
Total	98.4	100.0	97.3	100.0
Missing	1.6		2.7	

For the analyses that are used to make population inferences a weighting procedure was used. Weighting adjusts for intended design differences in the sampling ratios[7] and for differential participation[8]. In this report the results of weighted results are recorded so that populations are appropriately represented. Table 2.5 records the distribution of social and demographic characteristics in the weighted sample.

Table 2.5 also shows that there were few missing data on any of the characteristics. There were missing data for parental occupation from four per cent of respondents, for Indigenous status of two per cent of respondents, for geographic location of two per cent of respondents, for language background of one per cent of respondents and very few for sex. Data for parental education have not been reported because of the high levels of respondents who indicated that they did not know (33% of Year 6 and 13% of Year 10) in addition to those who did not answer the question (2% of Year 6 and 3% of Year 10). More detail about the sample is provided in Appendix 2.

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 estimate of the statistic based on repeated sampling would be expected to fall for 95 of 100 samples drawn. The difference between two estimates is considered statistically significant at the five per cent level if the confidence intervals of those estimates do not overlap.

The magnitude of the confidence interval can be estimated using formulae based on assumptions about the distribution of the measure being considered (typically assuming a normal distribution), from modelling based on assumptions about the distributions of different levels of clustering in the sample or from empirical methods that examine the actual variation in the sample.

The survey sample design in this study involves clustering, stratification, and disproportionate allocation which means 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

7 This is because students from smaller states or territories are sampled at a greater rate than students in larger states to ensure similar numbers and similar precision for all states.

8 Because some groups of students are more prone to not participate this ensures that results are not biased by differences in participation among schools.

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 (OECD, 2005: 174 – 184). 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.

Summary

The national assessment of ICT literacy was based on a clearly articulated definition of the concept that was consistent with international practice. This definition was elaborated in terms of key elements that made up three strands of a draft progress map that postulated the levels through which students would be expected to progress in ICT. The progress map formed the basis of the assessment that was developed to be administered on identical computers in a proctored environment to students in Year 6 and Year 10. The assessment instrument included different types of item including some simulated screens and some authentic tasks that used “real” software applications. The items were organised in thematic modules designed to represent different contexts with any individual student completing one common module and two modules assigned at random from a set of six. The achieved sample was not biased and represented the major categories of student in appropriate numbers.

Chapter 3
A Profile of ICT Literacy

The responses of 7,373 students to 227 assessment items (or strictly speaking 227 possible score points associated with a smaller number of tasks) from the seven assessment modules (the GST and the HAMs) provide the basis for establishing a profile of ICT literacy. This chapter outlines that process, establishes a profile based on six levels of proficiency and reports the distribution of students from Year 6 and Year 10 over that profile. The key to the process is analysis using item response modelling (the Rasch model) through which it is possible to analyse the pattern of student responses (which items and how many items they successfully completed) to establish students' ICT literacy level in relation to the test and the difficulty of each item (based on the proportion of students who successfully complete each item). This process is also the key to generating a single achievement scale on which the items from each of the different assessment modules can be located. This is feasible because a large number of students completed every possible combination of modules; each student completed three of the seven HAMs and all students completed the GST. On the basis of the scaled map of item difficulties it is possible to describe proficiency levels that provide a generalised description of the typical ICT achievements that can be expected of students at each level.

Establishing an ICT Literacy Scale

The analysis that was conducted using the Rasch model is based on the property that the chance that a student will answer an item correctly depends on their ability and the difficulty of the item[9]. The analysis results in a single continuous scale on which it is possible to locate students according to their ICT literacy and assessment items according to the degree of ICT literacy required to complete the item. A student placed at a certain point on the ICT literacy scale would most likely be able to successfully complete tasks at or below that location, and increasingly be more likely to complete tasks located at progressively lower points on the scale, but would be less likely to be able to complete tasks above that point, and increasingly less likely to complete tasks located at progressively higher points on the scale.

It is possible to illustrate the relationship between the difficulty of tasks and the ICT literacy of students using examples shown in Figure 3.1. The first example task required students to “paste text from the clipboard into a document”. This was completed successfully by 90 per cent of all students (Year 6 and Year 10 combined). The second example task is one in which students were required to “apply a style heading to a paragraph in a document”. This was successfully completed by 60 per cent of all students. The third example task is one in which students were required to “sort data in a spreadsheet according to specific criteria”. This was a relatively difficult item and was completed successfully by 18 per cent of all students.

In relation to these tasks we can consider the performance of three hypothetical students. Student A has a high level of ICT literacy, student B has a moderate level of ICT literacy and student C has a low level of ICT literacy.

Using these data it could be concluded that:

- Student A would typically be able to complete tasks 1 and 2 successfully and probably task 3 as well.
- Student B would typically be able to complete task 1 successfully and probably task 2 as well but would be unlikely to be able to complete task 3.
- Student C would be unlikely to be able to complete task 3 or task 2 but could probably complete task 1.

9 In this case, ability and difficulty refer to students’ ICT ability according to the assessment items developed to represent the substance of the ICT assessment framework and the amount of ICT difficulty required for students to satisfactorily complete each assessment item respectively.

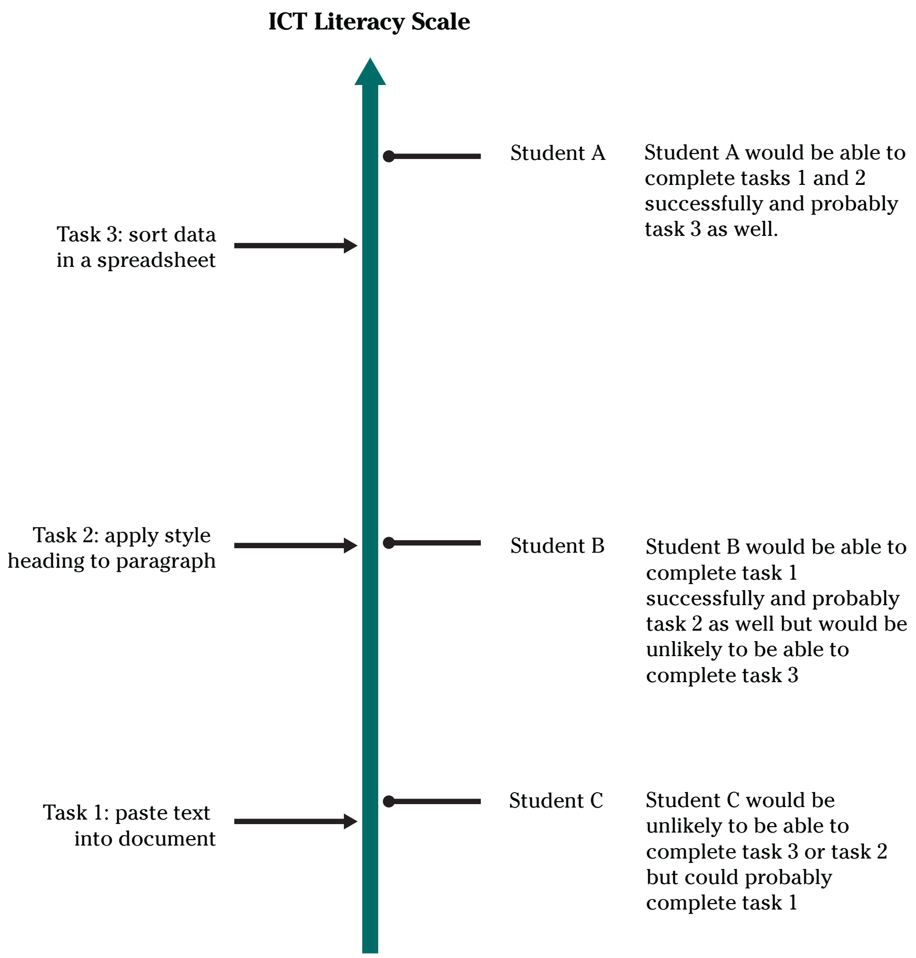


Figure 3.1: Relationship between tasks and student performance on the ICT literacy scale

Figure 3.2 is a result of an analysis of which items were successfully completed by each student. It depicts the relationship between student ICT literacy and the assessment tasks. The relationship between the student and the tasks is based on the probability that a student will complete a task correctly. The scale is expressed in “logits” (the logarithm of the ratio of the odds that the task would be performed successfully compared to not completing the task successfully). This scale empirically operationalises the fundamental concept illustrated in Figure 3.1 that if a student is located at a point above a task, the likelihood that the student can successfully complete that task is relatively high, and if the student is located below the task, the likelihood of success for that student on that task is relatively low.

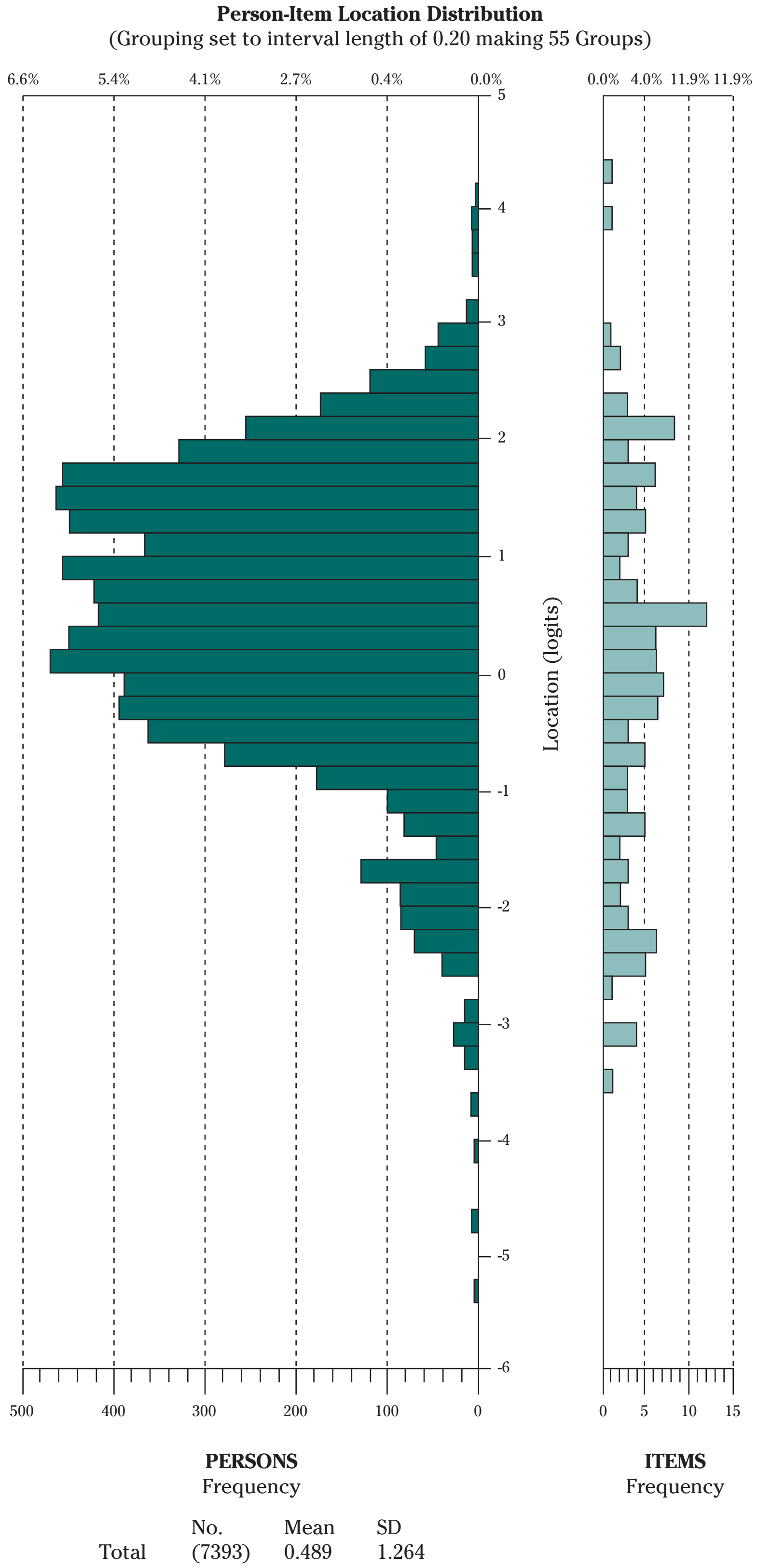


Figure 3.2: Student ICT Literacy Scores and ICT Literacy Item Difficulties

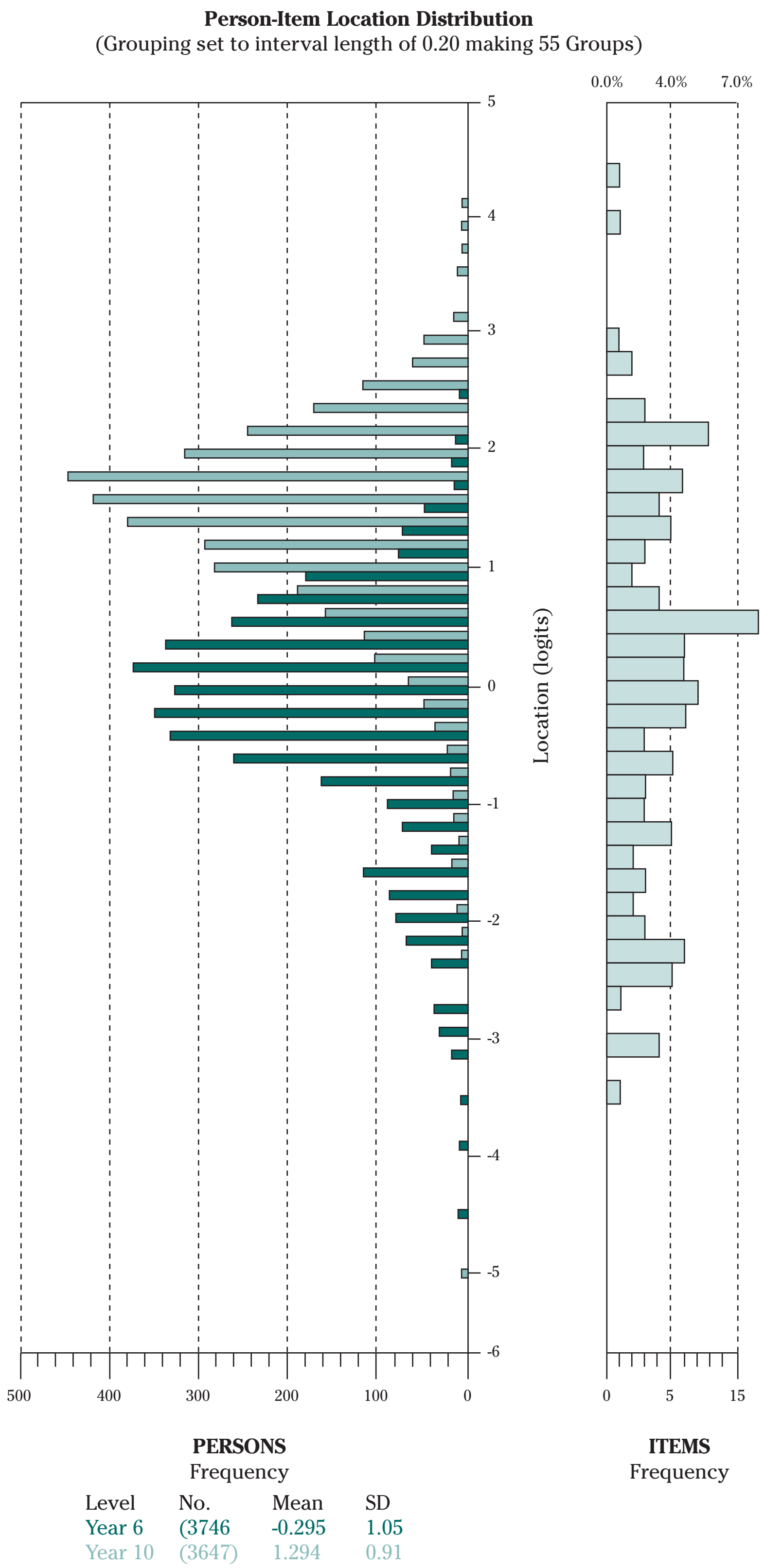


Figure 3.3: Student ICT Literacy Scores for Year 6 and Year 10 and Task Difficulties

Figure 3.2 indicates that the tasks in the ICT literacy assessment spanned a wide range of difficulties and that the range of task difficulties was appropriate for the spread of ICT literacy among students in Year 6 and Year 10.

Differences between Year 6 and Year 10 Students

Figure 3.2 records data on the ICT literacy of all students in the survey combining Year 6 and Year 10. It is of interest to examine the distribution of ICT literacy for Year 6 and Year 10 students separately and thus investigate the extent to which the assessment was appropriately targeted. Figure 3.3 records the distributions for Year 6 and Year 10 separately but in the same diagram.

The data in Figure 3.3 indicate that although the ICT literacy scores of Year 6 and Year 10 students overlap there is a good level of separation. The mean score for Year 10 students was much greater than that of Year 6 students. An average Year 10 student was approximately 1.4 times as likely as an average Year 6 student to complete an assessment task of average difficulty.[10].

Reporting ICT Literacy Scale Scores

In keeping with the practice of other sample surveys in the Australian National Assessment Program, the results for ICT literacy have been standardised to have a mean score of 400 and a standard deviation of 100 for Year 6 students. The choice of these values means that about two-thirds of the Year 6 students have ICT literacy scores between 300 and 500 points. It follows from setting these scale points that for Year 10 the mean ICT literacy score is 550 and the standard deviation is 97.5.

The analyses provided information about two other properties of the ICT literacy scale. The first was that the items formed one dimension. In other words the range of items represented one underlying construct. The second was that it was reliable in the sense of being internally consistent. In technical terms the person separation index was 0.93 (on a metric where 0 would be totally unreliable and 1 would be perfectly reliable).

Establishing and Reporting 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. In this case six proficiency levels were defined and descriptions were developed to characterise typical student performance at each level. The percentage of students in each proficiency level could then be calculated. The levels and the percentage in each level are used to summarise the performance of

10 Expressed in more technical terms the difference in the mean for Year 6 and Year 10 was 1.6 logits which means that the logarithm of the odds ratio was 1.6.

students overall, to compare performances across subgroups of students, and to compare average performances among groups of students. The proficiency levels are set out in Table 3.1.

Table 3.1: ICT Literacy Proficiency Level Descriptions

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.
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, or using a single pull-down menu function to save all the attachments of an email to a new location. • identify security risks associated with internet data and explain the importance of respecting and protecting the intellectual property rights of authors.

Level	Proficiency level description	Examples of student achievement at this level
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 common software and file management functions such as left aligning selected text, rotating an image 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.
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. • 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 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.

To form the proficiency levels, the continuum of increasing ICT literacy is 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. Information about the items in each level has been used to develop summary descriptions of the ICT literacy associated with different levels of proficiency. These summary descriptions are then used to encapsulate ICT literacy of students associated with each level. As a set, the descriptions encapsulate a representation of growth in ICT literacy. Table 3.1 describes the levels of proficiency in detail.

The proficiency levels defined in Table 3.1 require a number of decisions so that they can be used to summarise and report student performance. The scale of 'ICT literacy' is continuous and the use of performance levels, or levels of proficiency, involves an essentially artificial division of that continuous scale into discrete parts. The number of divisions and the location of the cut-points that mark the boundaries of the divisions need to be determined.

The creation of performance levels involves assigning a range of values on the continuous scale to a single level. A procedure similar to that used in the PISA study was adopted (OECD, 2004). Students were assigned to the highest level for which they would be expected successfully to complete the majority of assessment items. If items were spread uniformly across a level, a student near the bottom of the level would be expected successfully to complete at least half of the assessment items from that level. Students at progressively higher points in that level would be expected to correctly answer progressively more of the questions in that level.

The relationship between students and items recognises that there is some uncertainty about whether a student could successfully complete any given item on the scale (it is based on probabilities). However, it is possible to estimate the probability that a student at a particular location on the scale (and therefore a particular level) would be expected successfully to complete specified items. When the expectation that a student would be able to successfully complete 'at least half of the items' in a level, the student would be placed in that level.

Illustrative Examples of ICT Proficiency

The content focus across the levels in the ICT literacy proficiency scale described in Table 3.1 shifts and broadens from the lower to the higher levels. The lower levels of the scale focus on students' ICT skills whereas the higher levels reflect students' increasing capacity to use ICT skill to source and reframe information for specific communicative purposes. Achievement at the higher levels of the scale is demonstrated by students' sets of responses across HAMs that involve research and analysis of information leading up to the production of a communicative task. In order for students to provide evidence of research and communication using ICT at the higher levels, two of the HAMs that allow students to demonstrate these higher levels of achievement are described and illustrated in Tables 3.2 and 3.3. These are followed by illustrative examples from the two HAMs of student achievement for the higher levels (Levels 6, 5 and 4) on the scale.

Table 3.2: Video Games and Violence Hybrid Assessment Module – Overviews and Large Tasks

Overview

Students are told that they are organising a class forum around the topic "Violent Video Games and Teenagers". The students complete a closed information search about the topic, appraise and review the quality and trustworthiness of the sourced material and then complete some charts of empirical data in preparation for their final communicative task.

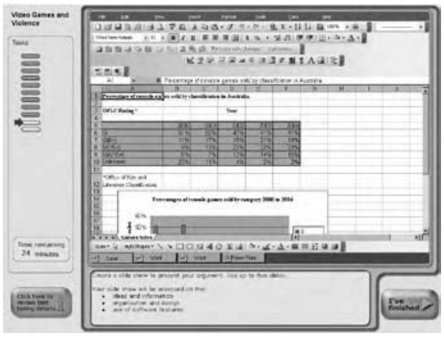
Large Task

Students prepare a PowerPoint presentation about the relationship between video games and violence using a uniform set of the information that they have been working with in the lead-up to the large task. The student presentations were assessed against 7 discrete criteria relating to the students' use of the available information and software features with respect to the communicative purpose of the presentation.

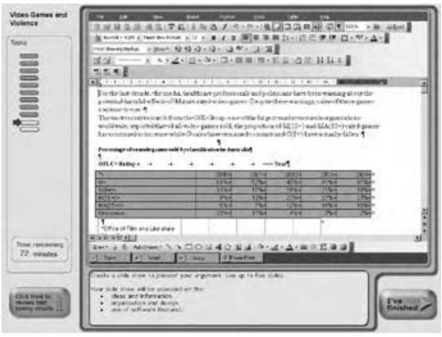
Below are screenshots of the four software resources that students used to complete the large task.

Screen 1: New PowerPoint presentation file on which students completed the presentation.

Screen 2: Spreadsheet containing data and a chart of the same data that students could make use of to complete their presentation.



Screen 3: Document containing text and data from a web-page that students could make use of to complete their presentation.



Screen 4: Document containing text from an alternate web-page that students could make use of to complete their presentation.

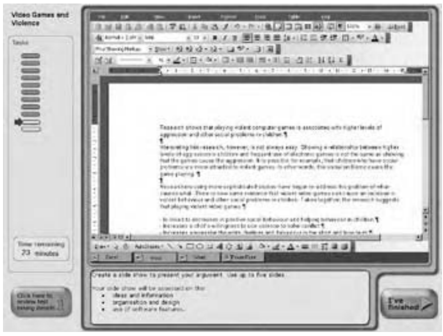


Table 3.3: Conservation Project Hybrid Assessment Module – Overview and Large Tasks

Overview

Students are told that they are to assist in the planning of a tree-planting conservation project at their school. The students complete a closed set of communication and data management tasks (such as using email and spreadsheet software) as they collect information in preparation for their final communicative task.

Large Task

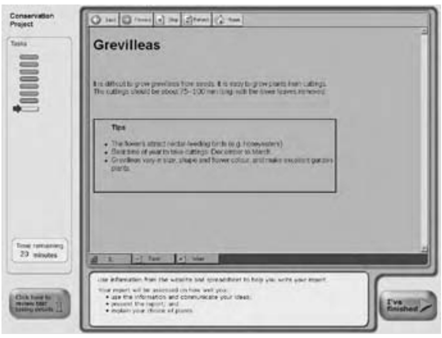
Students add substantive content to and edit a set of broad headings in an electronic document in order to produce a report (including recommendations) to their principal about the tree-planting project. Students source their information from a closed web environment and data in a provided spreadsheet. The student reports were assessed against 4 criteria relating to the students' use of the available information and software features with respect to the communicative purpose of the report.

Below are screenshots of the four software resources that students used to complete the large task.

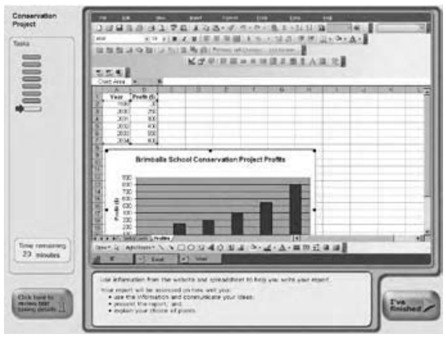
Screen 1: Report template with headings on which students completed the report.

Screen 2: Homepage of plant information website that contains information students could make use of to complete the report.

Screen 3: One of four plant information pages within the plant information website that students could make use of to complete the report.



Screen 4: Workbook containing two spreadsheets of data that students could make use of to complete the report.



Illustrative Examples: Levels 6, 5 and 4

Level 6

The PowerPoint presentations completed by students working at Level 6 typically had the following features[11]:

- The sequence of slide content was organised with an introduction leading through information and argument to a logical conclusion or open ended discussion point.
- The key points from the available resources were included using at least some original expression. The key points were linked and explicated with students' own words.
- The use of colour supported readers' understanding of the slides by showing strong contrast between text and the background and consistency of colour use across different text structures (such as headings).
- The layout of the slides was balanced and the layout features were used consistently to fit their communicative purpose throughout the presentation.
- When included, tables and charts were supported by text that clearly described their content and meaning.

The conservation project reports completed by students working at level 6 typically had the following features:

- The structure of the report was clear and logical and transitions between the sections were used to make the report a single integrated piece.
- Software tools (such as styles and font types) were used consistently to format the components of the report to highlight the structure and support understanding of the contribution of the components to the report.
- Data included in the report had a clear purpose, description and explanation and were used to support recommendations for action.

Level 5

The PowerPoint presentations completed by students working at Level 5 had the following features:

- The use of colour showed evidence of planning, the use of colour mostly highlighted text structures (such as headings).
- The layout of the slides was largely balanced and the layout features were mostly used to fit their communicative purpose.
- When included, tables and charts were supported by some text to describe their content and meaning.
- The sources of information used in the presentation were cited.

11 The illustrations of work at any given level assume that the features of work at lower levels have also been demonstrated or exceeded. This is assumed for all levels.

The conservation project reports completed by students working at level 5 typically had the following features:

- The structure of the report was clear and logical.
- The tone and style of the report were consistent throughout the report and the report was clearly targeted to the principal (audience).
- Data were included in the report with some explanation. Recommendations for action were included.

Students working at Level 5 were also able to complete information analysis tasks such as describing three potential problems when downloading files from the internet and identifying different reasons that suggest the information on a website might be unreliable.

Level 4

The PowerPoint presentations completed by students working at Level 4 had the following features:

- There was some organisation in the sequence of the slide content and these were supported by the use of headings.
- Relevant charts and tables were copied and pasted into the presentation.
- Relevant pieces of text (usually sentences) were copied from resources and pasted into the presentation. Some of these sentences were semantically linked with student's own words.

The conservation project reports completed by students working at level 4 typically had the following features:

- The report style was largely consistent and showed evidence of being targeted to the principal as the audience.
- Information from a range of the available software sources was included in the report.

Students working at Level 4 were also able to complete information management and analysis tasks such as searching for a file with the word 'greenhouse' in it, selecting the most reliable website from a summary set returned by a search engine, or explaining why some software is created with an expiry date.

Illustrative Examples: Levels 3, 2 and 1

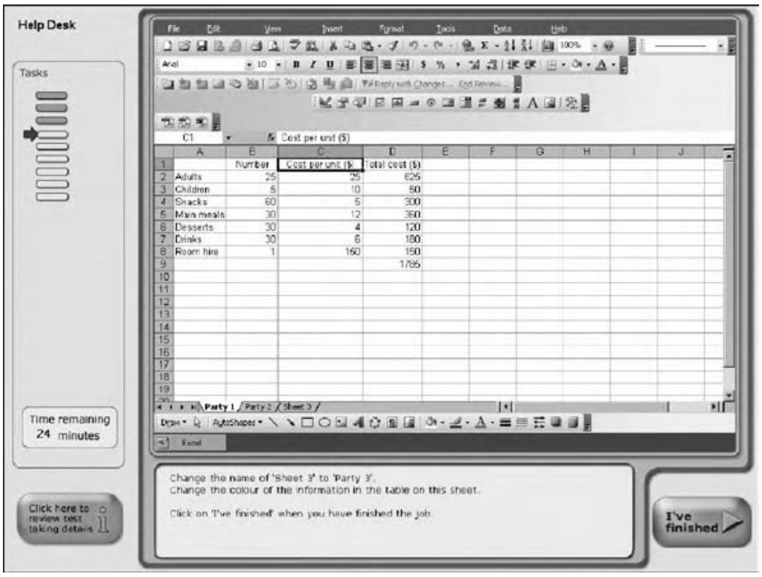
As the ICT literacy scale extends downwards from Level 6, the proportion of scale content detailing skills and simple, single process information management (such as editing or adding text for example) increases and the proportion of scale content detailing students' creation of original ICT content decreases. As such, the illustrations of achievement at these lower levels tend to be student responses to discrete tasks, rather than global judgements that can be made across large pieces of student work (such as the presentation and report that were used to illustrate achievements at Levels 6, 5 and 4). Following are examples of assessment items that are indicative of achievement at each of Levels 3, 2 and 1. Three items, one from each strand in the ICT literacy progress map, have been selected as indicative of achievement at each level.

Level 3

Level 3 Illustrative Example 1

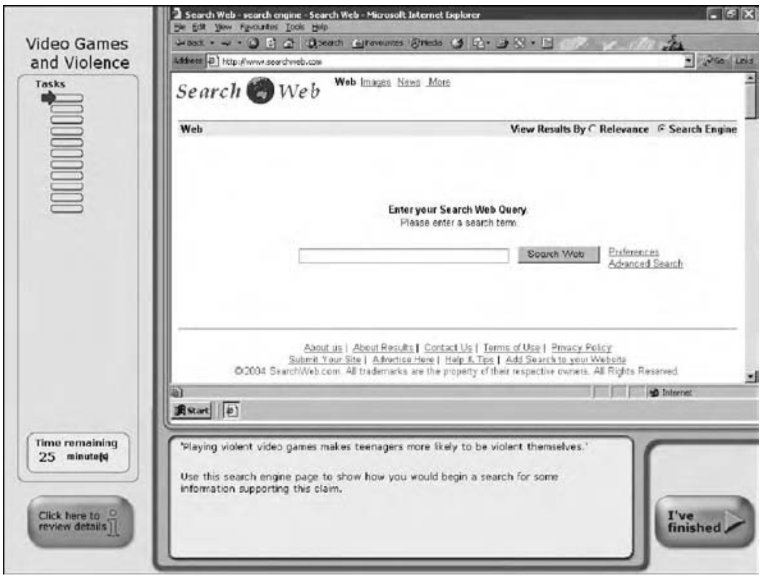
In this example students were asked whether it was 'okay' to use text produced by another person in their own work. Students working at Level 3 were typically able to identify either that using the work of another person without permission or citation was plagiarism or that in order to use the work of others it is necessary to seek permission from the author or, if only a small extract was to be used, to cite the source of the extract. This item was aimed to broadly measure student understandings of the basic principles of appropriation and citation of work rather than exploring the detailed (legal) nuance of copyright and permissions. This item is considered to represent Strand C of the ICT literacy progress map.

Level 3 Illustrative Example 2



In this example students are asked to change the colour of information in a table (both changing the font colour and changing the shading of the cells in the table were acceptable responses) and also to change the name of one of the inactive worksheets in the given (Microsoft Excel) workbook. Students working at Level 3 were typically able to make both the requested amendments to the workbook. This item is considered to represent Strand B of the ICT literacy progress map.

Level 3 Illustrative Example 3



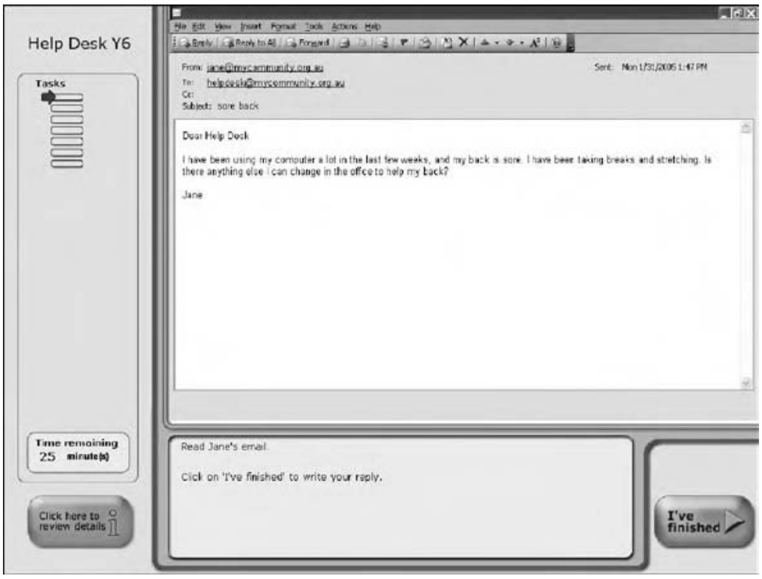
In this example students were asked to use the search engine provided to search for information on the topic “Playing violent video games makes teenagers more likely to be violent themselves”. Students working at Level 3 were typically able to include three of the following five key categories of search term in their information search:

1. violent/violence
2. video
3. games
4. teenagers/adolescents
5. cause/influence/effect (or a synonym)

This item is considered to represent Strand A of the ICT literacy progress map.

Level 2

Level 2 Illustrative Example 1



In this example students were asked to provide advice about how to alleviate neck soreness resulting from computer use. Students working at Level 2 were typically able to provide any single piece of simple computer-use advice such as adjusting the chair or screen height or using stretching exercises and rest breaks. This item is considered to represent Strand C of the ICT literacy progress map.

Level 2 Illustrative Example 2

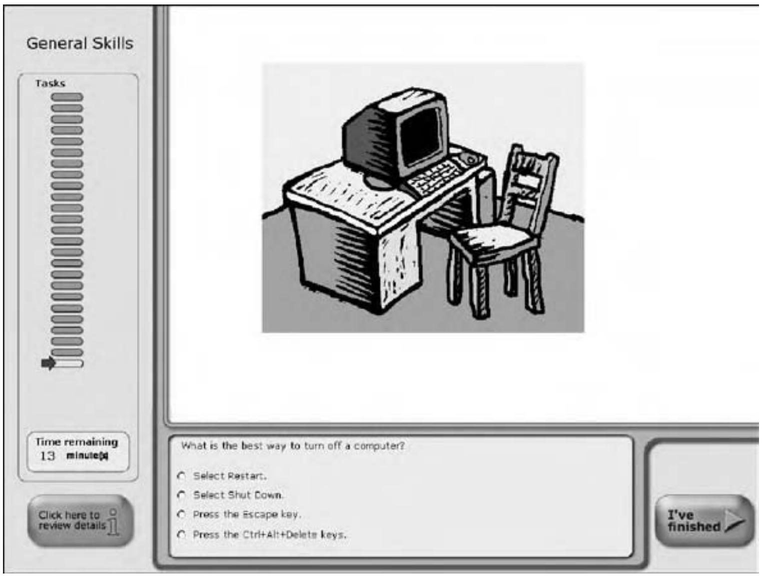
In this example students are asked to read an email and click on the hyperlink in the email. Students working at Level 2 were typically able to click on the hyperlink in the email. In completing this item successfully, students needed to know the term 'hyperlink' and also how to use the mouse to click on a hyperlink. This item is considered to represent Strand B of the ICT literacy progress map.

Level 2 Illustrative Example 3

In this example students were asked to click on (i.e. locate and click on) the link on a webpage that will help them locate information about symbols of the Northern Territory. Students working at Level 2 were typically able to locate and click on the 'Territory symbols' link. This item is considered to represent Strand A of the ICT literacy progress map.

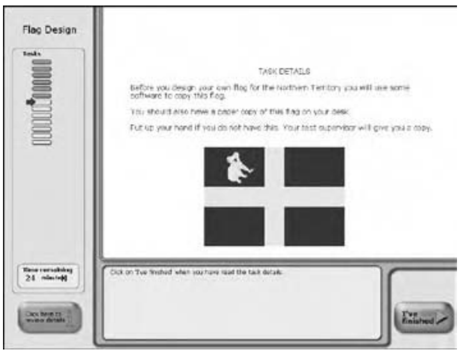
Level 1

Level 1 Illustrative Example 1

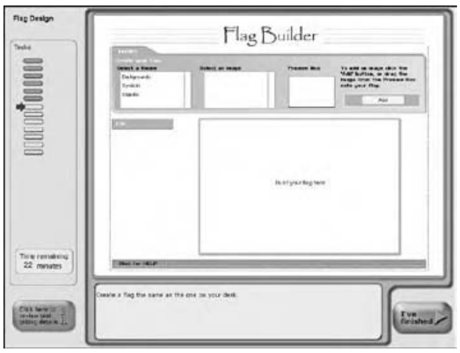


In this example students were asked identify the best way to turn off a computer from a set of four multiple-choice options. Students operating at Level 1 typically could identify selecting ‘Shut Down’ as the best way to turn off a computer. This item was successfully completed by more students than any other item in the assessment. The item is considered to represent Strand C of the ICT literacy progress map.

Level 1 Illustrative Example 2



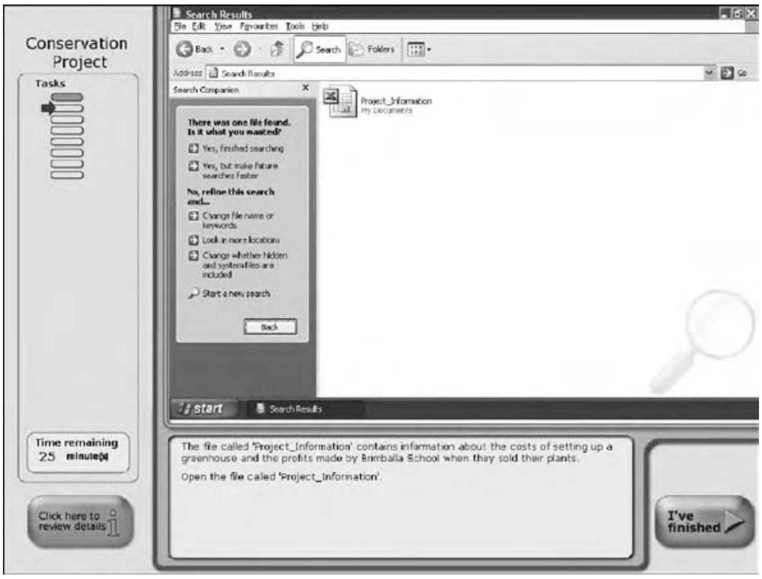
Task Overview



Example Item

In this example students were asked to use the simple graphics software shown in the Example Item (above right) to create a replica of the flag seen in the Task Overview (above left). Students working at Level 1 were typically able to select the background image by selecting ‘background’ from the menu and then selecting the appropriate background from a set (each background was shown on the screen when selected). Similarly students working at Level 1 were typically also able to select the koala image from a list of images and relocate and resize the image to match the given source. These tasks are considered to represent Strand B of the ICT literacy progress map.

Level 1 Illustrative Example 3



In this example students were asked to open a single specified file from the screen. Students operating at Level 1 typically could open the file. Students could use any method to open the file (such as double-clicking with the mouse, or using a menu option). The item is considered to represent Strand A of the ICT literacy progress map.

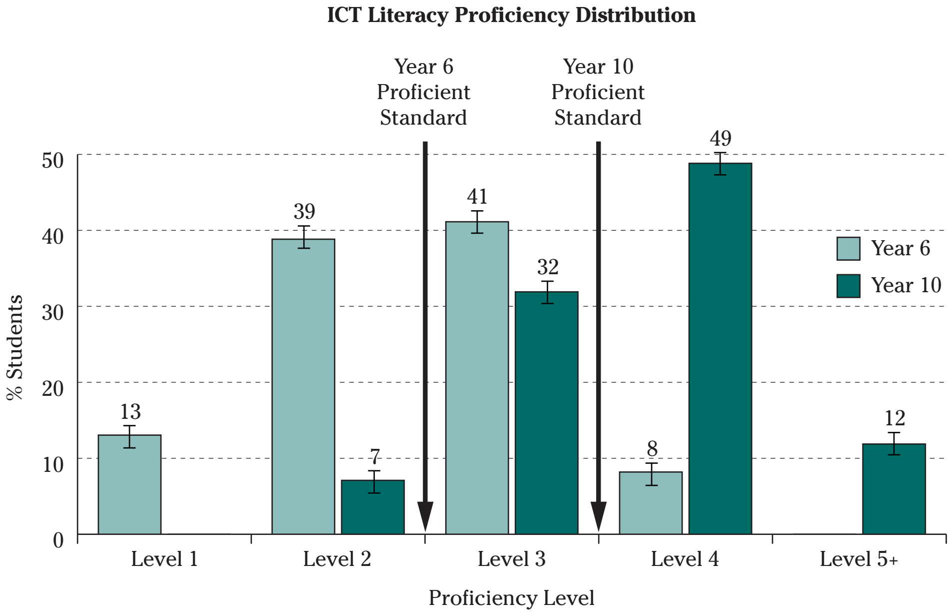
A Profile of ICT Literacy

On the basis of the student scores on the ICT literacy scale it is possible to develop a profile of Australian students in Year 6 and Year 10 in terms of the distribution of their levels of ICT literacy. Table 3.4 represents a profile of ICT literacy for Year 6 and Year 10 students in Australian schools. It contains information about the score range for each proficiency level and the percentage of Year 6 and Year 10 students in each proficiency level. Moreover, for each of the proficiency levels it is possible to characterise the tasks that a student at that level would be expected to complete successfully.

Only 0.6 per cent of Year 6 students and 0.1 per cent of Year 10 students performed at a level below the lower boundary of proficiency level 1. Only one Year 10 student exceeded the upper bound of the top proficiency level (Level 6). Thus the six proficiency levels fully span the range of student performance.

Figure 3.4 shows the distribution of Year 6 and Year 10 students over the proficiency levels characterised by the descriptors in Table 3.4. The data in Figure 3.4 indicate the difference between Year 6 and Year 10. Only eight per cent of Year 6 students performed at Level 4 or above compared to 61 per cent of Year 10 students. In contrast 51 per cent of Year 6 students performed at

Level 2 or below compared to seven per cent of Year 10 students. The overlap was mostly contained to one proficiency level – Level 3.



Note: Confidence intervals are shown for the percentages in each level.

Figure 3.4: Distribution of Year 6 and Year 10 Students over ICT Literacy Proficiency Levels

Table 3.4: ICT Literacy Profiles for Year 6 and Year 10

Year 6	Level	Year 10	Lower boundary
0%	**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.	0.4%	750
0.1%	**Level 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.	11.9%	625
7.7%	**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.	48.9%	500 (10p)
40.8%	**Level 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.	32.0%	375 (6p)
38.8%	**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.	6.4%	250
12.6%	**Level 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.	0.4%	

6p: Year 6 proficient standard
10p: Year 10 proficiient standard

Establishing Proficient Standards

In addition to deriving the ICT Literacy proficiency scale, proficient standards were established for each of 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 standards are important because they provide reference points of reasonable expectation of student achievement on the scale, but also because the standards refer to Year 6 which is the penultimate or ultimate year of primary schooling, and Year 10. In some senses the standards can be considered as markers of ICT literacy preparedness for students as they begin the transition to next stages of their educational or vocational lives.

The two proficient standards (one for Year 6 and one for Year 10) were established 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 Year 6 and Year 10 proficient standards were established on different days. Some members of the standards setting group worked on both standards, whilst some participated only in the Year 6 or Year 10 standards setting exercise.

In each case, the same process was used to generate the recommendations for the position of the proficient standards on the scale. The experts were first introduced to the notion of the 'challenging but reasonable' standard so that a common conceptual understanding of this notion was established. The process of establishing the proficiency cut-points used a combined modified-Angoff Method (Angoff, 1971) and Bookmark Method (Lewis, Mitzel & Green, 1999) for each of Grades 6 and 10. This process resulted in a recommendation from each expert for the item on the scale that should be deemed as the minimum achievable by a proficient student at Year 6 or Year 10.

In the modified-Angoff Method the experts were presented with each individual assessment item and asked simply to select 'Yes' or 'No' to identify whether they believed that a typical Year 6 or 10 student (depending on which level was being established) could reasonably be expected to complete the item successfully. These individual expert data were then collated and each expert received a summary data sheet that included their own rating for each item, the percentage of all expert raters who selected 'Yes' and 'No' for each item and the percentage of students in the target year level who successfully completed the item in the national assessment. The experts were then given the opportunity to consider and discuss their judgements.

In the Bookmark Method the experts were provided a list of the full set of assessment items in order from least difficult to most difficult according to the percentage of students at the target year level who successfully completed each item. The experts were then asked in groups to work their way up from the bottom of the scale and select the item that they felt was the most difficult that could reasonably be expected of a student in the target year level according to the notion of the 'challenging but reasonable' standard. Although these item cut-points were discussed in groups, each expert was finally asked to select the single item that they believed represented the appropriate 'challenging but reasonable' cut-point for the target grade level on the scale of all items.

These recommendations provided the basis for defining the cut-point of marginal proficiency for each of Year 6 and Year 10. Although there was a range of cut-point recommendations among the experts there was no overlap between the highest Year 6 recommendation and the lowest Year 10 recommendation. For each year level the experts' expectations of student achievement by item was consistently higher than the actual student achievement data suggested.

The set of expert judgements of the 'challenging but reasonable' proficient standard items for each Year level was used as the basis for establishing the proficient standards as points on the ICT Literacy proficiency scale for each of Years 6 and 10.

- The proficient standard for Year 6 was defined as the boundary between levels 2 and 3 or a score of 375 on the ICT literacy scale. From Table 3.4 it can be seen that 49 per cent of Year 6 students reached or exceeded the Year 6 proficient standard.
- The proficient standard for Year 10 was defined as the boundary between levels 3 and 4 or a score of 500 on the ICT literacy scale and 61 per cent of Year 10 students reached or exceeded the Year 10 proficient standard.

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 scale was standardised so that the mean score for Year 6 was 400 and the standard deviation for Year 6 was 100 points. Students from Year 10 recorded higher ICT literacy scores than students in Year 6 with the difference being 151 scale points (or 1.5 Year 6 standard deviations).

The ICT literacy scale could also be described in terms of six described proficiency levels that provide a profile of progress in ICT literacy 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.”

Forty-nine 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”.

Sixty-one 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.”

Chapter 4
Patterns of ICT Literacy

Australia's national goals for schooling assert that schooling should be socially just, so that:

> *Students' outcomes from schooling are free from the effects of negative forms of discrimination based on sex, language, culture and ethnicity, religion or disability; and of differences arising from students' socio-economic background or geographic location (MCEETYA, 1999: Goal 3.1).*

From the accumulated results of studies of student achievement in a wide range of fields, it is known that student achievement is influenced by factors such as: sex, socioeconomic background, language background, geographic location, and Indigenous status. Students come from a wide range of backgrounds and it is important to understand the extent to which these factors relate to their ICT literacy. ICT is a wide-reaching aspect of life in modern Australian society and students who do not develop proficiency in ICT are likely to be limited in the extent to which they can participate fully in economic and social life.

This chapter examines the relationship between students' ICT literacy and their personal and family backgrounds. It focuses on differences in ICT literacy between different groups of students in Year 6 and in Year 10. As part of the Sample Assessment of ICT literacy students completed a background survey through which information was collected about students' sex, socioeconomic background, Indigenous status, language background, school location and age. Those data provide the basis for a social mapping of patterns of ICT literacy across Australia. In addition, because education is a responsibility of State and Territory authorities, the survey data are used to investigate the extent to which there are variations in ICT literacy among States and Territories.

Three approaches are used to report differences in ICT literacy among groups of students. The first is to compare the mean achievement scores of groups on the standardised ICT literacy scale. This is the most powerful comparison because it makes use of the full distribution of data. The second is to compare the percentages of students from each group who are in each of the proficiency levels. The third is to compare the percentages of students in each group who have attained the proficient standard for the Year level.

Differences in ICT Literacy among States and Territories

Comparison of means for Year 6 and Year 10

Table 4.1 records the mean ICT literacy score for each State and Territory together with the 95 per cent confidence interval that indicates the level of accuracy with which the mean was measured (the narrower the confidence interval, the more accurate the measurement)[12].

Table 4.1: Means and Confidence Intervals for ICT Literacy by State and Territory

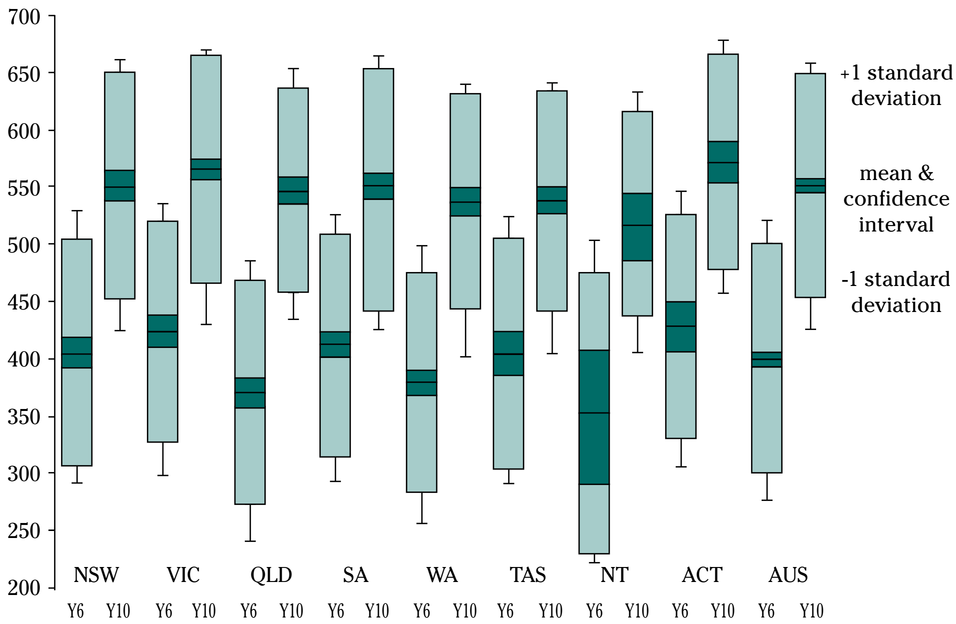
	Year 6		Year 10	
State or Territory	Mean Score	Confidence Interval	Mean Score	Confidence Interval
New South Wales	404.9	±12.9	550.6	±13.1
Victoria	423.5	±13.7	565.1	±9.8
Queensland	369.6	±12.3	546.6	±11.6
South Australia	411.9	±11.4	547.1	±11.0
Western Australia	379.4	±10.8	535.3	±11.8
Tasmania	404.2	±19.4	538.1	±11.8
Northern Territory	345.8	±53.7	515.3	±28.2
Australian Capital Territory	428.4	±22.1	571.8	±17.8
ALL	400.0	±6.3	550.6	±5.7

Notes: (a) Differences in confidence intervals reflect differences in sample sizes for jurisdictions as detailed in Table 2.4 as well as differences in the variation within jurisdictions. The larger confidence intervals for the Northern Territory and the Australian Capital Territory reflect the smaller sample sizes for those jurisdictions. For the Northern Territory the effect of the smaller sample size is compounded by the large variation in scores within the jurisdiction.

12 Each State and Territory mean is an estimate of the total population value, inferred from the result obtained by the sample of students tested. Because it was an estimate, it was subject to uncertainty. If the mean scores were estimated from different samples drawn from the same population of students, the actual results for the mean would vary a little. However, one can be confident that the population mean lies between the value obtained and about two standard errors (actually 1.96) on either side of it. This range is the confidence interval. According to statistical theory, the estimate of the mean from repeated sampling would be expected to fall within the range for 95 of 100 samples drawn.

The mean score for any State or Territory can be compared with that of any other State or Territory so that if the confidence intervals do not overlap the difference in the means is statistically significant. The differences in ICT literacy among States and Territories are greater at Year 6 than at Year 10. The difference between the highest jurisdictional mean ICT literacy score for Year 6 and the lowest is 83 scale points. At Year 10 the difference between the highest and lowest mean scores is 56 scale points. Correspondingly the differences between the second highest and second lowest mean scores for jurisdictions are 54 and 30 scale points for Year 6 and Year 10 respectively.

The data in Table 4.1 also indicate the difference in the mean scores between Year 6 and Year 10 which can be taken as an indication of the change or growth in ICT literacy between Year 6 and Year 10. For Australia as a whole this difference was 151 scale points. There was some variation among jurisdictions in the difference between Year 6 and Year 10 with the largest being for Queensland (177 points) and the smallest being for South Australia and Tasmania (134 to 135 points). Patterns are illustrated in Figure 4.1.



Note: Confidence intervals are shown for each jurisdiction

Figure 4.1: Mean ICT Literacy Scores by Year Level and Jurisdiction

Multiple comparison of jurisdictional means for Year 6 and Year 10

Table 4.2 records which of the multiple comparisons of Year 6 jurisdictional means are statistically significant at the five per cent level. These pair-wise comparisons are shown in lower left-hand quadrant of Table 4.2 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. From these data it can be seen that the mean scores for the Australian Capital Territory, Victoria and South Australia are significantly higher than the means for Western Australia, Queensland and the Northern Territory but not significantly different from the means for New South Wales and Tasmania. The mean for New South Wales is significantly higher than that for Western Australia and Queensland and the mean for Tasmania is significantly higher than that for Queensland.

Table 4.2: Multiple Comparisons of Mean Year 6 ICT Literacy by State and Territory

	Mean	Conf. Inter.	ACT	VIC	SA	NSW	TAS	WA	QLD	NT
Australian Capital Territory	428.4	±22.1		●	●	●	●	▲	▲	▲
Victoria	423.5	±13.7	●		●	●	●	▲	▲	▲
South Australia	411.9	±11.4	●	●		●	●	▲	▲	●
New South Wales	404.9	±12.9	●	●	●		●	▲	▲	●
Tasmania	404.2	±19.4	●	●	●	●		●	▲	●
Western Australia	379.4	±10.8	▼	▼	▼	▼	●		●	●
Queensland	369.6	±12.3	▼	▼	▼	▼	▼	●		●
Northern Territory	345.8	±53.7	▼	▼	▼	●	●	●	●	

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.

Legend:
● denotes no significant difference in mean scale scores
▼ denotes mean is significantly lower than the comparison jurisdiction
▲ denotes mean is significantly higher than the comparison jurisdiction

However, there is an argument that, when making multiple comparisons (that is, comparing the performance of one jurisdiction with those of the others in the set), an allowance needs to be made for the possibility that a comparison could appear significant by chance (since one is making many comparisons from the same data). Multiple comparison significance tests that limit the probability of mistakenly finding a difference in performance were applied and the results are recorded in the top right-hand quadrant of Table 4.2. This adjustment is called the Bonferroni adjustment[13] In practice applying the Bonferroni adjustment made little difference to the pattern simply rendering the comparison between South Australia and the Northern Territory non-significant.

13 When and whether the Bonferroni adjustment should be applied is the subject of ongoing debates among statisticians. Those debates centre on whether the comparisons are simple pair-wise comparisons or are genuinely multiple comparisons. The Bonferroni adjustment was applied by the OECD to country comparisons in PISA in 2000. In PISA 2003 both adjusted and un-adjusted results were reported and in PISA 2006 the adjustment will not be applied.

Table 4.3 records the multiple comparisons of the Year 10 means for ICT literacy. As was recorded in the previous table comparisons without the Bonferroni adjustment are recorded in the lower left-hand quadrant and comparisons incorporating the Bonferroni adjustment are recorded in the upper right-hand quadrant. Applying the Bonferroni adjustment made no difference to the results for Year 10 students. It can be seen that fewer of these comparisons are statistically significant than for the Year 6 comparisons in Table 4.2. The mean ICT literacy scores for the Australian Capital Territory and Victoria are significantly greater than those for Tasmania, Western Australia and the Northern territory. No other means are significantly different at the five per cent level.

Table 4.3: Multiple Comparisons of Mean Year 10 ICT Literacy by State and Territory

	Mean	Conf. Inter.	ACT	VIC	NSW	SA	QLD	TAS	WA	NT
Australian Capital Territory	571.8	±17.8		●	●	●	●	▲	▲	▲
Victoria	565.1	±9.8	●		●	●	●	▲	▲	▲
New South Wales	550.6	±13.1	●	●		●	●	●	●	●
South Australia	547.1	±11.0	●	●	●		●	●	●	●
Queensland	546.6	±11.6	●	●	●	●		●	●	●
Tasmania	538.1	±11.8	▼	▼	●	●	●		●	●
Western Australia	535.3	±11.8	▼	▼	●	●	●	●		●
Northern Territory	515.3	±28.2	▼	▼	●	●	●	●	●	

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.

Legend: ● denotes no significant difference in mean scale scores
▼ denotes mean is significantly lower than the comparison jurisdiction
▲ denotes mean is significantly higher than the comparison jurisdiction

Comparisons of jurisdictional means with the national mean

Another approach to the examination of jurisdictional means is to make comparisons with the national mean using the data recorded in Table 4.1. When this comparison is made at Year 6 level it appears that there are three groups of jurisdictions.

- Year 6 students from Victoria and the Australian Capital Territory have means that are statistically significantly greater than the national mean.
- Year 6 students from Queensland and Western Australia are statistically significantly lower than the national mean.

- Year 6 students from New South Wales, South Australia, Tasmania and the Northern Territory are not significantly different from the national mean (although for the Northern Territory this is largely a result of the large confidence interval that reflects the small sample size).

In the case of Year 10 students only the Northern Territory mean was significantly different from the national mean.

This comparison of jurisdictional means does tend to mask differences because the jurisdictions are part of the overall comparison group. However, it is a comparison that is of general interest and is therefore reported here.

Comparison of distributions

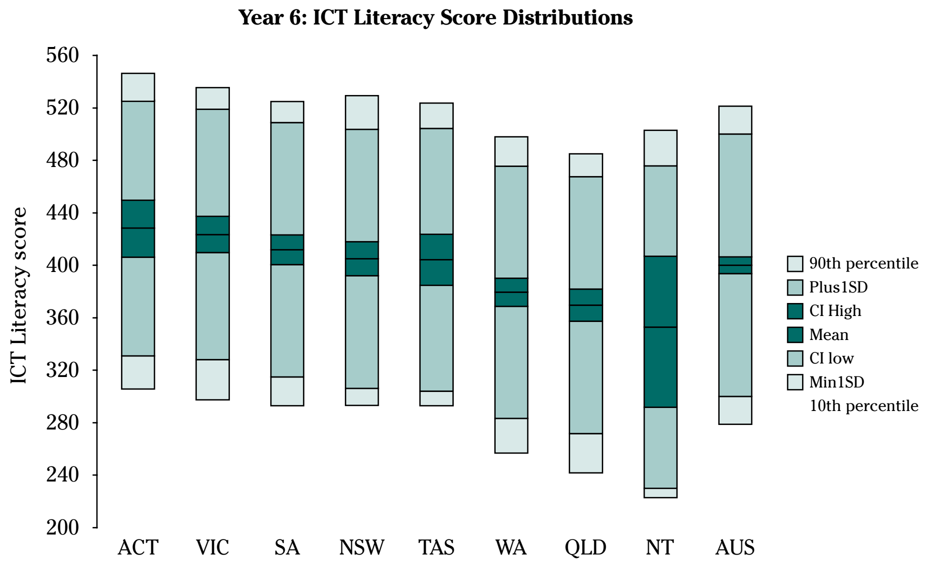
In addition to examining the mean ICT literacy scores, the distributions of student achievement scores for States and Territories were examined. Figure 4.2 displays the scaled means and distributions for States and Territories at Year 6 and Year 10.

In each case the length of the bar shows the range of scores for the middle 80 per cent of students (those between the 10th and 90th percentiles)[14]. The outer shaded section shows the range of one standard deviation above and below the mean. The centre darker section is the confidence interval associated with the mean. The multiple comparisons of the means reported in Tables 4.2 and 4.3 correspond to the overlap, or lack of overlap, between the darker shaded areas for jurisdictions on the vertical achievement scale.

The spread of scores achieved by the middle 80 per cent of Year 6 students across all students in Australia was approximately 243. The Northern Territory had the widest spread of scores (a range of about 257 scale points). South Australia had the smallest spread of scores (232 scale points).

The spread of scores achieved by the middle 80 per cent of Year 10 students was 233 scale points. Again the Northern Territory had the widest spread of scores (249 scale points). Queensland had the lowest spread of scores (217 scale points).

14 The 10th percentile is the point on the scale below which 10% of the student scores are located and the 90th percentile is the point on the scale above which 10% of the student scores are located.



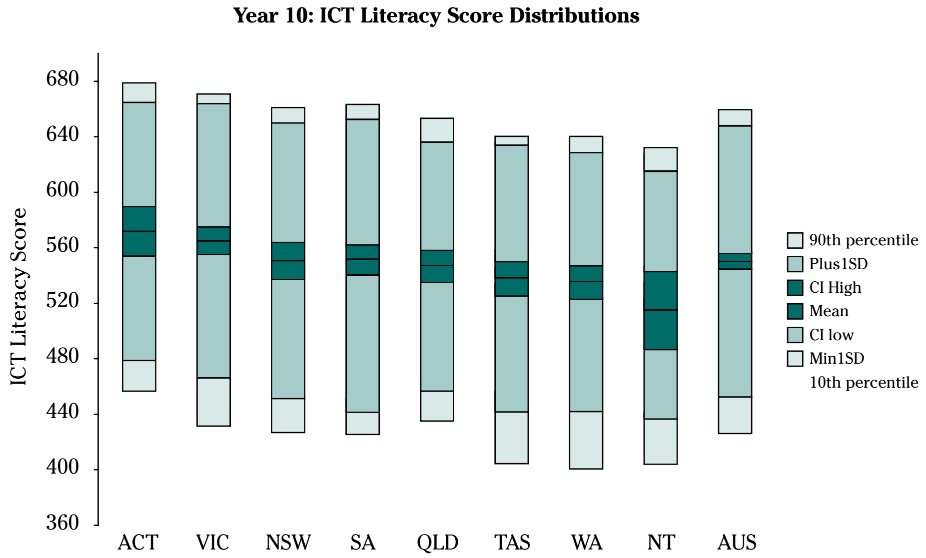


Figure 4.2: Distributions of ICT Literacy Scores in States and Territories

Table 4.4: Percentages of Year 6 Students at Each Proficiency Level on the ICT Literacy Scale by State and Territory

	Percentage in Each Proficiency Level					% at or above Proficient Standard
	Level 1	Level 2	Level 3	Level 4	Above 4	
New South Wales	10.5	39.1	41.8	8.6	0.1	50.5
(confidence interval)	±3.3	±5.2	±6.0	±3.6	±0.2	±6.6
Victoria	8.6	33.6	47.4	10.3	0.1	57.9
(confidence interval)	±3.8	±4.7	±4.5	±3.4	±0.1	±6.3
Queensland	19.3	43.0	33.6	4.0	0.1	37.7
(confidence interval)	±4.8	±4.7	±4.8	±1.7	±0.3	±5.3
South Australia	10.4	37.8	42.7	8.7	0.3	51.7
(confidence interval)	±3.6	±5.7	±4.0	±3.6	±0.7	±5.0
Western Australia	17.2	43.1	35.0	4.4	0.2	39.6
(confidence interval)	±4.7	±4.9	±5.3	±1.9	±0.8	±5.4
Tasmania	10.3	40.8	40.4	8.0	0.4	48.9
(confidence interval)	±5.1	±7.7	±8.4	±4.5	±1.1	±9.0
Northern Territory	24.2	39.7	33.3	2.8	0.0	36.0
(confidence interval)	±12.2	±11.5	±9.0	±2.6	±0.0	±10.0
Australian Capital Territory	8.5	33.1	45.5	12.8	0.1	58.4
(confidence interval)	±4.9	±11.4	±9.9	±7.0	±0.8	±12.5
Australia	12.6	38.8	40.8	7.7	0.1	48.6
(confidence interval)	±1.6	±2.3	±2.7	±1.5	±0.1	±3.0

Comparison of percentages in proficiency levels

Table 4.4 shows the percentage of Year 6 students who attained each of the proficiency levels across the States and Territories.

Overall, 49 per cent of students attained Level 3 or above (the Year 6 proficient standard). In an analogous manner to the multiple comparisons of jurisdictional means it is also possible to compare the percentages of students attaining the proficient standard for Year 6 and Year 10. Table 4.5 records which of the comparisons of percentage of Year 6 students attaining the proficient standard are statistically significant at the five per cent level. These are shown 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 4.5 records comparisons of the percentage attaining the proficient standard in each jurisdiction with the percentage of students across Australia that attained the proficient standard. Victorian students performed significantly above the Australian average of 49 per cent[15]. There was no significant

15 Even though the boundaries of the confidence intervals touch a more precise analysis by testing the z-score of the difference indicates that the difference is statistically significant.

difference between the national performance and that of students in Tasmania, New South Wales and South Australia. In Queensland and Western Australia the proportion of students attaining the proficiency level was significantly lower than the Australian average.

Table 4.5: Multiple Comparisons of Percentage of Year 6 Students Attaining the Proficient Standard in ICT Literacy by State and Territory

	% Prof.	Conf. Int.	ACT	VIC	SA	NSW	TAS	WA	QLD	NT
Australian Capital Territory	58.4	±12.5								
Victoria	57.9	±6.3	●							
South Australia	51.7	±5.0	●	●						
New South Wales	50.5	±6.6	●	●	●					
Tasmania	48.9	±9.0	●	●	●	●				
Western Australia	39.6	±5.4	▼	▼	▼	●	●			
Queensland	37.7	±5.3	▼	▼	▼	▼	●	●		
Northern Territory	36.0	±10.0	●	▼	●	●	●	●	●	
Australia	48.6	±3.0	●	▼	●	●	●	▲	▲	●

Notes:

The Bonferroni adjustment has not been applied to these data because it was developed for multiple comparisons of means rather than percentages.

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.

Legend:
● denotes no significant difference in percentages
▼ denotes percentage is significantly lower than the comparison jurisdiction
▲ denotes percentage is significantly higher than the comparison jurisdiction

For the Australian Capital Territory and the Northern Territory the sample sizes limit our certainty about the differences from the national average even though they are relatively large in magnitude. The percentage of students attaining the proficient standard in the Australian Capital Territory was not significantly different from the national average (although the difference was nine percentage points). For the Northern Territory the percentage of students attaining the proficient standard was not significantly different from the national average (although the gap was 13 percentage points).

However, when the comparisons among jurisdictions including confidence intervals are taken into account, the groups appear to be slightly different with overlap between the groups. It remains clear that Western Australia and Queensland perform lower than most of the other jurisdictions. Victorian students performed significantly above Western Australia and Queensland but did not differ significantly from South Australia, New South Wales and Tasmania.

Table 4.6 records the percentage of Year 10 students attaining each proficiency level in each jurisdiction. Table 4.7 provides information regarding the percentage of Year 10 students attaining the proficient standard for each jurisdiction and in comparison with the national percentage. For Australia overall, 61 per cent attained Level 4 or above (the proficient standard). There were no significant differences in the percentage of students attaining the proficient standard across the States and Territories for Year 10.

Table 4.6: Percentages of Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by State and Territory

	Percentage in Each Proficiency Level					% at or above Proficient Standard
	Level 2 or below	Level 3	Level 4	Level 5	Level 6	
New South Wales	7.1	31.8	49.4	11.2	0.5	61.1
(confidence interval)	±2.5	±7.5	±6.4	±3.3	±1.0	±7.6
Victoria	5.9	27.6	49.1	16.7	0.7	66.5
(confidence interval)	±1.9	±4.5	±5.0	±4.1	±1.2	±4.8
Queensland	5.7	34.8	49.0	10.4	0.2	59.5
(confidence interval)	±2.8	±6.9	±8.1	±3.1	±0.5	±7.4
South Australia	6.1	32.5	49.4	11.6	0.4	61.4
(confidence interval)	±2.4	±4.1	±5.3	±3.6	±0.6	±5.0
Western Australia	9.3	34.9	47.6	8.2	0.0	55.8
(confidence interval)	±4.2	±4.7	±5.6	±3.0	±0.2	±6.1
Tasmania	8.7	35.0	47.2	9.0	0.1	56.4
(confidence interval)	±4.2	±7.0	±5.3	±3.9	±0.4	±6.4
Northern Territory	14.4	37.0	40.9	7.7	0.0	48.6
(confidence interval)	±11.3	±8.1	±13.6	±5.9	±0.0	±13.2
Australian Capital Territory	4.0	30.5	47.5	17.5	0.5	65.5
(confidence interval)	±3.1	±12.5	±7.4	±8.7	±1.3	±11.4
Australia	6.8	32.0	48.9	11.9	0.4	61.2
(confidence interval)	±1.2	±2.9	±2.7	±1.5	±0.4	±3.1

Table 4.7: Multiple Comparisons of Percentage of Year 10 Students Attaining the Proficient Standard in ICT Literacy by State and Territory

	% Prof.	Conf. Int.	ACT	VIC	NSW	SA	QLD	WA	TAS	NT
Victoria	66.5	4.8								
Australian Capital Territory	65.5	11.4	●							
South Australia	61.4	5.0	●	●						
New South Wales	61.1	7.6	●	●	●					
Queensland	59.5	7.4	●	●	●	●				
Tasmania	56.4	6.4	●	●	●	●	●			
Western Australia	55.8	6.1	●	●	●	●	●	●		
Northern Territory	48.6	13.2	●	●	●	●	●	●	●	
Australia	61.2	3.1	●▼	●	●	●	●	●	●	●

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.

Legend: ● denotes no significant difference in percentages
▼ denotes percentage is significantly lower than the comparison jurisdiction
▲ denotes percentage is significantly higher than the comparison jurisdiction

Summary

There were differences in the means and dispersion of student ICT literacy among States and Territories at Year 6. For Year 6 the gap in ICT literacy between the top two jurisdictions (the Australian Capital Territory and Victoria) and the bottom two jurisdictions (Queensland and the Northern Territory) was a little more then 50 scale points. The difference between the top two and bottom two jurisdictions in the percentages of students attaining the Year 6 proficient standard was approximately 20 percentage points.

For Year 10 students the differences among jurisdictions were not as great. The gap in mean ICT literacy scores between the Australian Capital Territory and the Northern Territory was 56 scale points but the gap between Victoria and Western Australia (the next widest gap) was 30 scale points. There were no significant differences among jurisdictions in the percentage of students attaining the proficient standard at Year 10. The range covering the six States was 11 percentage points with a gap between Victoria and the Northern Territory of 18 percentage points.

Differences in ICT Literacy between Males and Females

It was anticipated that there may have been differences in ICT literacy between male and female students. While there was a 14 scale point difference in mean scores in favour of female students for Year 6 and nine scale points at Year 10, these differences were not statistically significant. Relevant data are recorded in Table 4.8.

Table 4.8: Differences in ICT Literacy between Male and Female Students at Year 6 and Year 10

	Year 6				Year 10			
	Males		Females		Males		Females	
State	Mean Score	Conf. Interval	Mean Score	Conf. Interval	Mean Score	Conf. Interval	Mean Score	Conf. Interval
NSW	399.2	±19.6	411.6	±12.3	549.0	±15.7	552.5	±15.5
VIC	419.5	±18.4	427.5	±12.7	561.8	±11.6	568.5	±16.7
QLD	355.9	±16.5	382.9	±14.7	538.8	±17.2	554.2	±9.6
SA	400.1	±16.3	421.7	±14.3	539.1	±15.5	554.2	±15.5
WA	375.3	±13.5	383.9	±13.3	526.9	±15.3	542.9	±12.0
TAS	402.7	±16.9	406.1	±25.1	534.1	±18.8	543.0	±16.9
NT	334.8	±52.1	362.9	±56.3	514.1	±30.0	516.7	±40.8
ACT	415.1	±27.6	437.9	±29.8	568.1	±29.0	575.2	±21.0
ALL	392.9	±9.2	407.4	±6.5	546.2	±7.6	555.4	±6.9

Table 4.9 records the percentages of male and female students in each proficiency level and those at or above the proficient standard for the relevant Year level. At Year 6 there are seven percentage points more females than males who had attained the proficient standard but this difference was not statistically significant (i.e. the confidence intervals overlap). At Year 10 there were three percentage points more females than males who had attained the proficient standard and this difference was also not statistically significant. A greater proportion of females than males attain the proficient standard for ICT but the difference is small.

Table 4.9: Percentages of Year 6 and Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by Sex

	Year 6				Year 10			
	Males		Females		Males		Females	
	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval
Level 1*	14.4	±2.6	10.7	±2.0	8.1	±1.8	5.5	±1.7
Level 2*	40.3	±4.2	37.3	±3.8				
Level 3	37.5	±4.0	44.2	±4.3	32.3	±3.9	31.6	±3.6
Level 4	7.7	±1.9	7.7	±2.0	48.0	±3.6	49.7	±3.4
Level 5**	0.2	±0.3	0.1	±0.2	11.2	±2.3	12.8	±2.2
Level 6**					0.4	±0.6	0.4	±0.5
Proficient Standard	45.4	±4.9	52.0	±4.1	59.6	±4.2	62.9	±3.5

* The percentages of Year 10 students at Levels 1 and 2 have been combined because the individual percentages within each level are very low.
** The percentages of Year 6 students at Levels 5 and 6 have been combined because the individual percentages within each are very low.

Differences in ICT Literacy by Socioeconomic Group

Parental occupation was used as the indicator of socioeconomic group. Data based on parental education have not been reported because of the high levels of respondents who indicated that they did not know their parents education (33% of Year 6 and 13% of Year 10). The occupations of parents were provided by students and classified into five 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; (4), unskilled labourers, office, sales and service staff; and (5), not in paid work in the last 12 months.

Where occupations were available for two parents, the higher coded occupation was used as the indicator of socioeconomic group. Mean scores for each group of students (based on the parental occupation that was the higher in cases where two parental occupations were indicated) are recorded in Table 4.10.

Table 4.10: Differences in ICT Literacy among Socioeconomic Groups at Year 6 and Year 10

Group	Mean Score	Confidence Interval	Number of Cases
Year 6 Students			
Senior managers and professionals	450.3	±11.7	505
Other managers and associate professionals	424.4	±6.0	1,097
Skilled trades, clerical and sales	392.3	±7.9	1,016
Unskilled manual, office and sales	363.1	±8.5	873
All coded students	403.3	±6.1	3,491
Year 10 Students			
Senior managers and professionals	586.2	±9.4	599
Other managers and associate professionals	560.3	±7.0	1,327
Skilled trades, clerical and sales	542.4	±6.6	958
Unskilled manual, office and sales	520.6	±10.8	545
All coded students	553.8	±5.8	3,429

Note: Table does not include students who indicated that their parents had not been in paid work for 12 months. There were 107 students in Year 6 who had a mean ICT literacy score of 332.6 and 65 students at Year 10 who had a mean ICT literacy score of 476.3. The numbers in this group are too small to generate estimates with any precision.

The data in Table 4.10 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 87 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 65 points. Students whose parents had not been in paid employment for 12 months scored at or below the level for those whose parents worked in occupations classified as “unskilled manual, office and sales” but the numbers were too small to provide stable estimates of performance.

Notwithstanding the level of missing data, it was possible to compare the mean scores of Year 10 students whose parents had completed Year 12 with those whose parents had not completed Year 12. The mean ICT literacy score for Year 10 students whose parents had completed Year 12 was 562 scale points and for those whose parents had not completed Year 12 the mean score was 529 scale points; a difference of 33 scale points. Among Year 6 students the corresponding values for the mean ICT literacy scores were 420 scale points for those whose parents had completed Year 12 and 390 scale points for those whose parents had not completed Year 12. These results provide an indication of the difference in ICT literacy associated with parental school attainment but the estimates should be treated with caution because of the level of data that could not be coded, especially among Year 6 students.

Table 4.11: Percentages of Year 6 and Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by Socioeconomic Group

	Unskilled manual, office & sales		Skilled trades, clerical & sales		Other managers & ass. professionals		Senior managers & professionals	
	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval
Year 6 Students								
Level 1	19.0	±3.3	13.0	±2.9	7.1	±2.2	4.5	±2.6
Level 2	48.9	±6.2	40.9	±4.4	34.1	±4.8	27.4	±5.6
Level 3	28.9	±5.5	40.3	±4.5	49.0	±5.4	52.3	±7.0
Level 4	3.1	±1.9	5.8	±2.2	9.8	±2.6	14.9	±5.2
Level 5 Level 6	0.1	±0.2	0.0	±0.0	0.1	±0.2	0.7	±1.0
Proficient Standard	32.0	±5.7	46.1	±4.5	58.9	±4.8	68.0	±6.1
Year 10 Students								
Level 1								
Level 2	11.2	±4.6	6.9	±2.3	5.8	±1.6	2.3	±1.9
Level 3	40.0	±6.6	36.0	±5.9	28.5	±3.9	22.3	±5.3
Level 4	41.7	±7.7	46.8	±6.0	52.2	±4.2	55.2	±6.0
Level 5	6.9	±3.8	9.8	±2.9	13.0	±2.7	19.8	±4.2
Level 6	0.2	±0.6	0.5	±0.9	0.5	±0.6	0.4	±0.8
Proficient Standard	48.8	±7.0	57.1	±5.8	65.7	±4.0	75.4	±5.4

Note: In Year 6 29.5 per cent of the 107 students whose parents had been unemployed for 12 months attained the proficient standard in ICT literacy. In Year 10 32.0 per cent of the 65 students whose parents had been unemployed for 12 months attained the proficient standard in ICT literacy. In both cases the confidence intervals are large (+/- 14 and +/- 22 percentage points)

Table 4.11 records the corresponding data as the percentage of students in each proficiency level by socioeconomic group. Those data indicate that twice the percentage of Year 6 students from the "senior manager and professional" group (approximately two thirds) as from the "unskilled manual, office and sales" group (approximately one third) attained the proficient level in ICT literacy. Among Year 10 students the gap between these two socioeconomic groups was just a little smaller. In Year 10, 75 per cent more students from the "senior manager and professional" group (three-quarters) compared with 49 per cent from the "unskilled manual, office and sales" group (approximately half) attained the proficient level in ICT literacy.

From the data in Tables 4.10 and 4.11 it is clear that there is a substantial association between socioeconomic background and ICT literacy that is similar to that in other fields (Sirin, 2005).

Table 4.12: Differences in ICT Literacy between Indigenous and Non-Indigenous Students at Year 6 and Year 10

Indigenous Status	Mean Score	Confidence Interval	Number of Cases
Year 6			
Non Indigenous	404.9	±6.3	3,447
Indigenous	338.5	±23.3	239
All	400.5	6.2	3,686
Year 10			
Non Indigenous	553.2	±5.5	3,433
Indigenous	482.0	±23.5	136
All	551.1	±5.7	3,569

Differences in ICT Literacy by Indigenous Status

Indigenous Year 6 and Year 10 students' mean ICT literacy relative to that of non-Indigenous students is shown in Table 4.12. At both year levels, Indigenous students did not perform as well as non-Indigenous students on the ICT literacy Scale. The gap between the non-Indigenous and Indigenous students was about 70 scale points at both year levels. This difference is statistically significant and substantial. It is similar to the differences reported between Indigenous and non-Indigenous students in other studies of achievement.

The percentage of Indigenous and non-Indigenous students at each proficiency level are shown in Table 4.13. It can be seen that the distribution of Indigenous students across the proficiency levels is skewed towards the lower levels compared to the distribution of non-Indigenous students. At Year 6, 25 per cent of Indigenous students were located in proficiency level 1 compared to 11 per cent of non-Indigenous students. In contrast, only one per cent of Indigenous students in Year 6 were located in proficiency level 4 and above compared to eight per cent of non-Indigenous students.

There is a similar pattern in Year 10. Approximately 21 per cent of Indigenous students were located in proficiency levels 1 and 2 compared to six per cent of non-Indigenous students. Six per cent of Indigenous students were located in proficiency levels 5 and 6 compared to 13 per cent of non-Indigenous students.

The pattern of ICT literacy can be summarised by the observation that the percentages of non-Indigenous students attaining the proficient standard for each Year were substantially greater than the percentages of Indigenous students. In Year 6 the comparison is 50 per cent compared to 30 per cent. In Year 10 the comparison is 62 per cent compared to 35 per cent.

Table 4.13: Percentages of Year 6 and Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by Indigenous Status

	Year 6				Year 10			
	Indigenous		Non-Indigenous		Indigenous		Non-Indigenous	
	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval
Level 1	25.2	±10.6	11.4	±1.6	20.7	±10.1	6.4	±1.1
Level 2	44.9	±15.6	38.5	±2.5				
Level 3	28.7	±13.1	41.9	±2.9	44.3	±12.7	31.3	±2.9
Level 4	1.1	±3.1	8.1	±1.6	29.2	±10.9	49.6	±2.8
Level 5	0.1	±0.4	0.1	±0.2	5.8	±5.8	12.3	±1.6
Level 6					0.0	±0.0	0.4	±0.4
Proficient Standard	29.9	±12.9	50.1	±3.1	35.0	±11.5	62.3	±3.1

Differences in ICT Literacy by Language Background

Table 4.14 compares the mean scores of students who spoke languages other than English at home with students who spoke only English. There was no significant difference between these groups of students at either year level. At Year 10 students with a language background other than English scored slightly lower than students who spoke only English at home but the difference was not statistically significant. The distributions across the proficiency levels of students who spoke languages other than English at home compared with those students who spoke only English are shown in Table 4.15. A similar pattern to that shown by the means is evident. At both year levels, the proportion of students who speak languages other than English at home achieving the proficient standard was not different from the proportion of those who speak only English at home.

Table 4.14: Differences in ICT Literacy between Students with a Language Background Other than English and Other Students at Year 6 and Year 10

Language background	Mean Score	Confidence Interval	Number of Cases
Year 6			
Other than English	399.8	±12.3	850
English	399.9	±6.0	2,859
All	399.9	±6.1	3,709
Year 10			
Other than English	544.8	±11.2	810
English	552.8	±5.9	2,769
All	550.7	±5.8	3,579

Table 4.15: Percentages of Year 6 and Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by Language Background

	Year 6				Year 10			
	Language Background Other than English		English-speaking Background		Language Background Other than English		English-speaking Background	
	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval
Level 1	13.5	±3.7	12.2	±1.9	8.0	±2.7	6.6	±1.5
Level 2	37.7	±4.9	39.4	±2.7				
Level 3	40.2	±5.4	41.0	±3.2	33.4	±5.1	31.1	±3.0
Level 4	8.7	±2.6	7.2	±1.6	45.9	±5.9	50.0	±3.0
Level 5	0.0	±0.0	0.2	±0.2	12.2	±3.4	12.0	±1.7
Level 6					0.6	±1.1	0.4	±0.4
Proficient Standard	48.8	±6.2	48.5	±3.2	58.6	±5.6	62.3	±3.3

Differences in ICT Literacy by Geographic Location

Table 4.16 shows 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.

Table 4.16: Differences in ICT Literacy among Students from Metropolitan, Provincial and Remote Locations at Year 6 and Year 10

Geographic Location	Mean Score	Confidence Interval	Number of Cases
Year 6			
Metropolitan	408.2	±8.2	2,402
Provincial	385.9	±9.7	1,153
Remote	344.9	±47.9	121
All	400.5	±6.2	3,676
Year 10			
Metropolitan	554.5	±7.3	2,345
Provincial	544.8	±12.0	1,069
Remote	504.4	±23.2	132
All	551.0	±5.8	3,546

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 difference between metropolitan and remote students, and the difference between provincial and remote students, was statistically significant. The fact that the difference between metropolitan and provincial locations is replicated in the two independent samples (Year 6 and Year 10) suggests confidence in the proposition that the difference between these locations is a real difference and not something that appeared by chance.

Table 4.17 records the percentages of students at each proficiency level from each the three locations; metropolitan, provincial and remote. The pattern is similar to that shown by the differences in mean ICT literacy scores and is replicated in Year 6 and Year 10 patterns. Students from metropolitan locations tend to be located towards the higher proficiency levels to a greater extent than their peers in provincial or remote locations. The pattern is apparent in the percentages of students attaining the proficient standard.

Table 4.17: Percentages of Year 6 and Year 10 Students at Each Proficiency Level on the ICT Literacy Scale by Geographic Location

	Metropolitan		Provincial		Remote	
	Per cent	Conf. Interval	Per cent	Conf. Interval	Per cent	Conf. Interval
Year 6 Students						
Level 1	11.2	±2.0	14.2	±3.2	26.1	±15.1
Level 2	36.8	±3.1	43.2	±5.4	41.4	±15.7
Level 3	42.9	±3.1	37.4	±5.8	30.1	±18.1
Level 4	8.8	±1.9	5.2	±2.4	2.5	±4.2
Level 5 Level 6	0.2	±0.2	0.1	±0.2	0.0	±0.0
Proficient Standard	51.9	±3.8	42.7	±5.5	32.6	±18.9
Year 10 Students						
Level 1 Level 2	6.6	±1.5	7.2	±2.9	15.4	±8.0
Level 3	30.6	±3.8	34.2	±5.4	38.8	±9.7
Level 4	49.2	±3.4	48.5	±5.4	39.0	±10.8
Level 5	13.2	±2.3	9.7	±3.7	6.7	±4.8
Level 6	0.4	±0.4	0.4	±0.9	0.1	±0.6
Proficient Standard	62.8	±4.1	58.6	±5.7	45.8	±9.7

In Year 6, 52 per cent of students from a metropolitan location attained the proficient standard compared with 43 per cent of students from a provincial location and 33 per cent of students from a remote location who attained the proficient standard. The differences between metropolitan and remote locations were statistically significant and the difference between metropolitan and provincial locations was just on the boundary of statistical significance. The difference between provincial and remote locations was large but it is not statistically significant because of the large confidence interval associated with the estimate based on the relatively small number of students in remote locations.

In Year 10, 63 per cent of students from a metropolitan location attained the proficient standard compared with 59 per cent of students from a provincial location and 46 per cent of students from a remote location who attained the proficient standard. The difference between metropolitan and remote locations was statistically significant but that between metropolitan and provincial locations was not statistically significant.

Overall, it can be concluded that geographic location is associated with ICT literacy. The very large confidence interval of the remote students (associated with the small numbers in remote locations) results in some differences not being statistically significant. However, the certainty that these differences are real differences is supported by the fact that they are replicated in both samples.

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.

A regression analysis is based on an equation that has ICT literacy as the outcome and the other variables as predictors. 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). 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 4.18.

In Table 4.18 the magnitude of the regression coefficient (B) represents the size of the net effect of each predicator on the ICT literacy scale units (where the mean for Year 6 is 400 and the standard deviation is 100 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 4.18 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.

Table 4.18 also shows the confidence intervals associated with the regression coefficients. If the magnitude of the coefficient is greater than the confidence interval it can be inferred that the coefficient is significantly different from zero and that there an effect of that predictor on ICT literacy that has not arisen as a result of chance[16].

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.
- 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). 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.[17]
- 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.

16 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 better estimates than multi-level modelling methods. Multi-level modelling assumes simple random samples from an infinite population at each level which is not the way samples for national assessment surveys are selected. PISA and TIMSS use replication methods to estimate precision because they also involve complex sample designs. 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.

17 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.

- 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.

Table 4.18: Results of Regression Analysis of ICT Literacy on Student Characteristics

	Year 6 Students			Year 10 Students		
Predictor	Regression Coefficient (B)	Conf. Interval	Variance Explained (R squared)	Regression Coefficient	Conf. Interval	Variance Explained (R squared)
Intercept						
b0	451.4			1135.7		
Block 1						
Age (years)	-7.2	±11.2	01	**-37.0**	±10.6	01
Sex (female 1, male 0)	**11.2**	±8.2		6.1	±8.0	
Block 2						
Indigenous (coded 1,0)	**-35.6**	±21.0	04	**-48.7**	±21.0	03
Language other than English (coded 1,0)	-8.1	±12.0		-7.8	±11.0	
Block 3 (compared to students with parents in unskilled occupations)						
Senior managers & professionals	**78.1**	±12.3	11	**61.5**	±12.2	07
Managers & associate professionals	**52.2**	±9.8		**36.5**	±11.0	
Tradespeople, skilled office, sales service	**24.8**	±9.0		**20.1**	±10.6	
Block 4 (compared to metropolitan students)						
Provincial location	**-14.3**	±12.2	12	-3.7	±13.7	07
Remote location	**-27.3**	±23.5		**-30.8**	±25.1	
Block 5 (compared to Queensland students)						
New South Wales	**33.1**	±14.7	15	**23.9**	±17.2	10
Victoria	**50.4**	±16.7		**37.9**	±14.9	
South Australia	**34.9**	±14.7		**19.1**	±14.1	
Western Australia	5.4	±11.8		-11.6	±14.1	
Tasmania	**43.7**	±20.0		**24.6**	±16.5	
Northern Territory	5.9	±33.1		-0.5	±30.4	
Australian Capital Territory	**44.2**	±25.1		**38.5**	±22.1	
Full model			14.7%			9.6%

* Regression coefficients in **bold** are significant ($\alpha < .05$).

Results of the regression analysis are shown in Table 4.18[18]. 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 ICT literacy

18 In Table 4.18 the regression coefficients are those from the full model whereas the percentage variance is reported for each block of variables. Greater detail regarding the effects of each step in the block-wise analysis on the regression coefficient will be reported elsewhere.

scores between 78 (Year 6) and 62 (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 52 (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 25 (Year 6) and 20 (Year 10) points.

Indigenous students had ICT literacy scores that were lower than that of non-Indigenous students by 36 scale points at Year 6 and 49 scale points at Year 10. Although these differences are moderate they are smaller than the differences that are observed in the national assessment of Civics and Citizenship and in successive cycles of PISA and TIMSS (the comparison is possible because in all of those studies the reporting scales have a similar standard deviation)[19].

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 (27 points) and Year 10 (31 points). Students from provincial locations had lower ICT literacy scores than their peers in metropolitan location for Year 6 (14 points) but there was no net difference between provincial and metropolitan locations in Year 10.

The effect of student sex was only evident in Year 6 (females had higher ICT literacy scores by 11 points) and age was only evident at Year 10. In Year 10 younger students had higher ICT literacy scores by three points per month compare to older students. Table 4.18 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 recorded in Table 4.18 indicate the net difference between the listed State and Queensland which was chosen as the reference).

On the basis of these analyses it could be concluded that Western Australia, Queensland and the Northern Territory have comparatively low ICT literacy scores in Year 6 and Year 10, net of any effects of differences in social and demographic characteristics. The other states have relatively higher ICT literacy scores at both Year 6 and Year 10. The process of adjusting also reduced the extent to which the Northern Territory fell behind that of other jurisdictions.

19 It is possible to compare this difference with those reported in other National Assessment Program and with results from PISA and TIMSS because in all of those studies the reporting scale is based on a standard deviation of 100 scale points. Indeed other scales could be transformed to a common standard deviation so as to enable comparison of effect size in each. By way of comparison the difference between Indigenous and non-Indigenous students in Civics and Citizenship was 70 scale points, in the 2003 science literacy assessment at Year 6 the difference was 66 points, in PISA 2003 and PISA 2000 the difference in mathematical literacy the difference was 86 scale points, in PISA 2003 the difference in reading literacy was 83 scale points and in TIMSS at Year 8 the difference was 68 scale points. The overall conclusion is that the differences between Indigenous and non-Indigenous students in ICT literacy are a little smaller than in these other area.

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 net advantage to these two jurisdictions averaged just less than 50 points at Year 6 and approximately 38 points at Year 10.

New South Wales and South Australia also performed better than the reference group but by approximately 34 points at Year 6 and 22 points at Year 10. Tasmanian Year 6 students performed at a similarly high level to their counterparts in the Australian Capital Territory in Year 6 but more like those in New South Wales and South Australia in Year 10.

It is of interest that the net effects associated with the jurisdictions are consistent between Year 6 and Year 10 (the net effect is consistently lower at Year 10 than Year 6 but patterns of differences between the jurisdictions remain fairly consistent across the Year levels). This suggests that there may be influences associated with the provision of ICT in schools that contributes to those differences.

The data in Table 4.18 also indicate that the combination of these social and demographic characteristics accounts for little of the variation in ICT literacy: 15 per cent in Year 6 and ten per cent in Year 10. Possibly there are differences in student experience of using ICT not included in this analysis that are associated with social and demographic characteristics. These will be investigated further in Chapter 5.

Another perspective on the results of the analysis derives from the amount of variance explained as each block of variables is added to the analysis. Student age and sex account for very little of the variance and those variables in combination with Indigenous status and language background account for only 3 or 4 per cent of the variance in students scores. Inclusion of socioeconomic background (block 3) adds an additional 7 per cent to the explained variance in the case of Year 6 and 4 per cent in the case of Year 10. Inclusion of location adds very little to the explained variance but the inclusion of the block of variables representing jurisdiction adds a further 3 per cent to the variance. Overall, the variables account for 15 per cent of the variance in Year 6 student ICT literacy scores and 10 per cent of the variance in Year 10 ICT literacy scores.

Concluding Comments

Student background characteristics are related to ICT literacy and the patterns are similar in Year 6 and Year 10. The largest effects contributing to differences of 60 to 70 scale points 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 but it indicates potentially something that might influence later opportunities. Indigenous status is also associated with ICT literacy to a moderate extent (after allowance is made for the associated influence of socioeconomic group and geographic location).

There was evidence of disadvantage in the development of ICT literacy for students from remote locations. The effect was consistently observed in Year 6 and Year 10. Whether those differences are associated with access and opportunity will be explored in the next chapter.

Finally, the analyses indicated that there were differences among jurisdictions that could not be accounted for by differences in social and demographic characteristics. The extent to which those differences can be attributed to differences in curriculum and teaching remains a topic for further study.

Chapter 5
Familiarity with ICT

In the international context, Australian students have substantial familiarity with ICT at home and school. Data from the Programme for International Student Assessment (PISA) conducted in 2003 indicate that Australia has one of the highest levels of computer availability in secondary schools among OECD countries, with an average of 3.3 students per computer compared to an OECD average of 6.3 students per computer (OECD, 2005). These findings also point to an improvement in school computing resources in Australia over the three years since 2000 when there was an average of 4.5 students per computer.

Data from PISA 2003 also provide information about the extent to which 15-year-old students have access to computers at home with 93 per cent of Australian 15-year-old students indicating that they had a computer at home which they could use for school work. The OECD average was 79 per cent and the Australian level of access was exceeded only by the Netherlands, Korea, Sweden and Norway and was greater than the level of access in the United Kingdom and the United States. PISA 2003 also revealed that 96 per cent of Australian 15-year-old students had a computer of some type at home and 83 per cent had a link to the internet.

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 2002. Ninety-two per cent of Australian Year 4 students had a computer at home and 81 per cent of those students use a computer both at school and at home (Martin et al., 2004). 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.

Despite these overall levels of access it is important to map the variations in familiarity with ICT because there is some evidence of differences in access across socioeconomic groups and small differences 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 (using the same survey questions), to investigate the ways in which students use ICT and to investigate the links between ICT literacy and familiarity with ICT.

Student Familiarity with ICT

In the national assessment survey two aspects of familiarity with 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 most school students have three or more years experience of using computers. Eighty per cent of Year 6 students and 86 per cent of Year 10 students had been using computers for three years or more.

Table 5.1: Student Experience of Computer Use

	Years of experience in using computers				
	Never	< 1 year	1 to 3 years	3 to 5 years	> 5 years
Year 6	1.0	4.2	15.1	25.4	54.3
(N = 3746)	(±0.4)	(±0.9)	(±1.6)	(±1.9)	(±2.7)
Year 10	0.7	3.0	10.5	21.8	63.9
(N = 3627)	(±0.4)	(±1.0)	(±1.3)	(±1.6)	(±2.3)

Note: Confidence intervals are shown in parentheses

Frequency of computer use

The national survey data also indicate that students were frequent users of computer technology. Relevant data are recorded in Table 5.2. Those data indicate that computer use is more frequent at home than at school for both Year 6 and Year 10 students. Forty-three per cent of Year 6 students and 58 per cent of Year 10 students use computers at home every day. In comparison 14 per cent of Year 6 students and 18 per cent of Year 10 students use a computer at school every day. Computer use at home is more frequent among Year 10 students than Year 6 students but there is no significant difference in the frequency of computer use at school between Year 6 and Year 10 students.

Table 5.2: Frequency of Computer Use at Home and School for Year 6 and Year 10 Students

	Frequency of computer use					Mean days per month
	Never	Less than monthly	Weekly to monthly	Few times per week	Every day	
Computer use at home						
Year 6	5.7	3.8	10.3	37.1	43.1	12.6
	(±1.3)	(±0.8)	(±1.0)	(±2.2)	(±2.7)	(±0.4)
Year 10	3.6	2.6	8.1	27.3	58.4	14.6
	(±0.9)	(±0.7)	(±1.4)	(±1.9)	(±2.5)	(±0.4)
Computer use at school						
Year 6	0.9	3.5	22.9	58.6	14.0	9.2
	(±0.5)	(±0.9)	(±2.2)	(±3.6)	(±2.8)	(±0.4)
Year 10	2.1	7.5	25.3	47.1	18.1	8.9
	(±1.4)	(±1.3)	(±2.3)	(±2.7)	(±2.4)	(±0.4)

Notes: Confidence intervals (95%) are shown in parentheses
Mean days per month calculated on the basis of 20 working days per month and five working days per week: Never = 0; less than monthly = 1; weekly to monthly = 4; few times per week = 10; every day = 20.
Variations in experience of using computers

In order to investigate differences among groups of students in their experience of using computers the percentage of students who had used a computer for more than five years was used as an indicator.

Among Year 6 and Year 10 students there were no significant differences between the percentages of males and females, or the percentages of students from different geographic locations, who had been using a computer for more than five years.

There were just a few significant differences among States and Territories in experience of using computers. Details are recorded in Table 5.3. Among Year 6 students, experience of computer use in South Australia was greater than that in New South Wales, Queensland, Western Australia, Tasmania and the Northern Territory by a statistically significant amount. In addition experience of using computers in Victoria and the Australian Capital Territory was significantly greater than in Queensland. Among Year 10 students experience with computers was greater in South Australia than in Western Australia, New South Wales, the Northern Territory, Queensland and the Australian Capital Territory. Victorian and Tasmanian Year 10 students had greater experience of computers than their counterparts in Queensland. Across both Year 6 and Year 10 it appears that experience of using computers is relatively high in South Australia and low in Queensland.

Table 5.3: Percentage of Students with more than Five Years Experience of Using Computers by State and Territory

	Year 6		Year 10	
	% with >5 years usage	Confidence Interval	% with >5 years usage	Confidence Interval
New South Wales	53.0	(±4.9)	61.3	(±4.9)
Victoria	60.4	(±7.0)	69.9	(±4.3)
Queensland	47.8	(±4.5)	58.5	(±4.8)
South Australia	63.6	(±3.8)	74.5	(±2.9)
Western Australia	50.7	(±5.6)	63.4	(±4.7)
Tasmania	51.9	(±4.5)	68.3	(±4.4)
Northern Territory	49.6	(±8.3)	59.2	(±9.1)
Australian Capital Territory	59.1	(±5.7)	58.4	(±6.2)

There are some significant differences associated with socioeconomic background. Relevant data are recorded in Table 5.4. The differences among the four groups are not statistically significant but if the four groups are collapsed to two the differences between the groups that could be labelled as "unskilled or skilled office and trade" and "professional or managerial" are statistically significant at both Year 6 and Year 10. It can be concluded from these data that socioeconomic differences in computer experience are between "unskilled or skilled office and trade" and "professional or managerial" and that difference exists at both Year 6 and Year 10.

Table 5.4: Percentage of Students with more than Five Years Experience of Using Computers by Socioeconomic Group

	Year 6		Year 10	
	% with >5 years usage	Confidence Interval	% with >5 years usage	Confidence Interval
Four occupational groups				
Unskilled manual, office and sales	52.0	(±4.7)	59.0	(±6.3)
Skilled trades, clerical & sales	49.9	(±4.9)	62.1	(±3.6)
Other managers & associate professionals	59.3	(±4.3)	67.7	(±3.3)
Senior managers & professionals	58.9	(±6.0)	67.1	(±5.0)
Two occupational groups				
Skilled or unskilled trades and office	50.9	(±3.6)	60.9	(±3.2)
Professional and managerial	59.2	(±3.6)	67.5	(±2.9)

There are some other differences in computer experience that are only statistically significant at Year 10. At Year 10, but not at Year 6, there is a higher percentage of non-Indigenous students than Indigenous students that have more than five years of computer experience (65 per cent (± 2.3) compared to 41.7 per cent (± 9.9). Also at Year 10 only there is a higher percentage of computer use by students for whom English is the main home language (66 per cent (± 2.7) compared to students for whom their home language is other than English (58 per cent (± 4.0)

Variations in frequency of using computers

In neither Year 6 nor Year 10 is there any significant difference in the frequency of using computers at home or at school between students for whom their home language is English and those for whom their home language is other than English.

There is a set of characteristics associated with differences in the use of computers at home, but not at school, among Year 10 students but not among Year 6 students: sex, Indigenous status and geographic location.

There is no significant difference in the frequency of computer use at home or at school between males and females among Year 6 students. However, there is a significant difference between male and female computer use at home among Year 10 students. There is no difference in school usage. Relevant data are recorded in Table 5.5.

There is a similar pattern for Indigenous students with no significant difference between Indigenous and non-Indigenous students at Year 6 in terms of either home or school use but with Indigenous students recording significantly lower home use than non-Indigenous students at Year 10. Relevant data are recorded in Table 5.5.

Table 5.5: Monthly Computer Usage for Females and Males, Indigenous and non-Indigenous Students and Different Locations among Year 10 Students

	Home use		School Use	
	Mean days per month	Confidence Interval	Mean days per month	Confidence Interval
Sex				
Females	14.2	(±0.46)	9.1	(±0.59)
Males	15.4	(±0.46)	9.7	(±0.44)
Indigenous Status				
Indigenous	12.6	(±1.54)	11.0	(±1.24)
Non-Indigenous	14.9	(±0.36)	9.4	(±0.40)
Geographic location				
Metropolitan	15.3	(±0.42)	9.1	(±0.51
Provincial	13.7	(±0.33)	10.0	(±0.59)
Remote	13.5	(±0.65)	10.8	(±1.93)

In terms of geographic location the difference in home computer use is between metropolitan and either provincial or remote locations (there is no difference between provincial and remote locations). Relevant data are recorded in Table 5.5. Those data suggest there is a divide between metropolitan and non-metropolitan locations in terms of home use of computers. However, other data in Table 5.5 show that there is no significant difference in the frequency of computer use at school between Year 10 students from different geographic locations.

There are differences in the frequency of computer use among socioeconomic groups. Relevant data are recorded in Table 5.6.

Year 10 students whose parents were "senior managers and professionals" recorded 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. Among Year 6 students the statistically significant difference was between students whose parents were "senior managers and professionals" and those students whose parents were in "unskilled manual, office or sales" or occupations. There were no differences in school use among these socioeconomic groups at either Year 6 or Year 10.

It seems reasonable to conclude that differences in computer use between the highest and lowest socioeconomic groups are evident but are not as large as might have been expected. Fifty one per cent (± 7%) of Year 10 students whose parents were employed in "unskilled manual, office or sales" occupations used a computer at home every day compared to 67 per cent (± 5%) of Year 10 students whose parents were employed as "senior managers and professionals". The corresponding comparison among Year 6 students was 39 per cent (± 5%) among students whose parents were from the "unskilled manual, office or sales" group and 46 per cent (± 5%) from the "senior managers and professionals" group.

Table 5.6: Index of Frequency of Use of Computers at Home and School by Socioeconomic Group

	Home use		School use	
	Mean days per month	Confidence Interval	Mean days per month	Confidence Interval
Year 6 students				
Unskilled manual, office and sales	11.9	(±0.7)	9.5	(±0.5)
Skilled trades, clerical & sales	12.9	(±0.7)	9.4	(±0.5)
Other managers & associate professionals	13.4	(±0.6)	9.7	(±0.5)
Senior managers & professionals	13.6	(±0.7)	9.7	(±0.7)
Year 10 students				
Unskilled manual, office and sales	13.7	(±1.24)	9.2	(±0.67)
Skilled trades, clerical & sales	14.4	(±0.61)	9.1	(±0.55)
Other managers & associate professionals	15.2	(±0.48)	9.5	(±0.55)
Senior managers & professionals	15.9	(±0.63)	10.1	(±0.73)

There are differences among States and Territories in the frequency with which students use computers in school. Table 5.7 shows a comparison of means for the reported frequency of using computers by Year 10 students.

Table 5.7: Frequency of Use of Computers at School among Year 10 Students by State and Territory

	Mean days per month	Conf. Interval	TAS	SA	VIC	NT	WA	QLD	ACT
Tasmania	12.7	±0.6							
South Australia	12.0	±0.8	●						
Victoria	11.6	±1.1	●	●					
Northern Territory	11.0	±2.4	●	●	●				
Western Australia	9.6	±1.0	▼	▼	●	●			
Queensland	9.6	±0.8	▼	▼	▼	●	●		
Australian Capital Territory	9.2	±0.8	▼	▼	▼	▼	●	●	
New South Wales	7.0	±0.6	▼	▼	▼	▼	▼	▼	▼

Note: 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.

Legend:
● denotes no significant difference in mean usage levels
▼ denotes mean is significantly lower than the comparison jurisdiction
▲ denotes mean is significantly higher than the comparison jurisdiction

Those data indicate a substantial variation in usage of computers at school by Year 10 students from the highest using jurisdictions (Tasmania, South

Australia and Victoria) to the lowest (New South Wales)[20]. The data shown in Table 5.8 for both Year 6 and Year 10 and for school and home use show much less variation among jurisdictions at Year 6. For school use the only statistically significant difference at Year 6 is between the highest using State (South Australia) and the lowest using State (New South Wales). The other differences are not statistically significant even though the pattern for Year 6 is similar to that for Year 10 (the correlation coefficient for the two sets of use data is 0.87).

Table 5.8: Index of Frequency of Use of Computers at Home and School by State and Territory

	Home use		School use	
	Mean days per month	Confidence Interval	Mean days per month	Confidence Interval
Year 6 students				
New South Wales	12.7	(±0.8)	8.8	(±0.8)
Victoria	13.4	(±0.6)	10.4	(±0.9)
Queensland	12.7	(±0.7)	9.6	(±0.6)
South Australia	12.3	(±0.5)	10.5	(±0.7)
Western Australia	12.4	(±0.5)	9.6	(±0.6)
Tasmania	12.8	(±0.7)	10.3	(±0.9)
Northern Territory	10.8	(±0.8)	10.3	(±1.0)
Australian Capital Territory	14.2	(±0.6)	10.2	(±2.0)
Year 10 students				
New South Wales	14.9	(±0.80)	7.0	(±0.61)
Victoria	15.6	(±0.59)	11.6	(±1.06)
Queensland	14.8	(±0.69)	9.6	(±0.79)
South Australia	14.7	(±0.63)	12.0	(±0.77)
Western Australia	13.2	(±0.95)	9.6	(±1.00)
Tasmania	13.2	(±0.93)	12.7	(±0.63)
Northern Territory	14.1	(±1.74)	11.0	(±2.35)
Australian Capital Territory	16.2	(±1.14)	9.2	(±0.78)

Table 5.8 also records the mean days per month on which students report using computers at home. At Year 6 there are some significant differences in home computer use. Home computer use in the Australian Capital Territory is significantly greater than in every jurisdiction other than Victoria. Home computer use by Year 6 students is significantly lower in the Northern Territory than in every other jurisdiction. In addition to these differences the data in

20 Data from the OECD Programme for International Student Assessment indicate differences among jurisdictions in the ratio of computers to students in secondary school (OECD, 2004; 2006). For Australia as a whole the ratio is 0.28. Jurisdictional ratios range from 0.23 in New South Wales, through 0.26 in the Australian Capital Territory, 0.28 in Queensland, 0.29 in Western Australia, 0.31 in Tasmania and South Australia, to 0.33 in Victoria and 0.35 in the Northern Territory. If the Australian Capital Territory is excluded there is a strong correlation between these data and the usage data in the present study (r=0.70). In the ACT reported school usage is lower than would be expected on the basis of availability.

Table 5.8 show that home computer use in Victoria is significantly greater than in South Australia.

Among Year 10 students there are fewer differences in the level of home computer use. At Year 10 home computer use in the Australian Capital Territory and Victoria is significantly greater than in Western Australia and Tasmania but there are no other statistically significant differences among jurisdictions. There is a modest association between levels of home computer use for jurisdictions at Year 6 and Year 10 (the correlation coefficient is 0.59) and between levels of school computer use at Year 6 and Year 10 (the correlation coefficient is 0.88). However, there is little association between jurisdictional levels of computer use at home and computer use at school for either Year 6 or Year 10.

Computer Platforms

As shown by the data in Table 5.9, the overwhelming majority of students reported using either windows-based computers or both windows-based and Macintosh computers. Taken together this amounted to 83 per cent of Year 6 students and 93 per cent of Year 10 students for their home computer use. If this is expressed as a percentage of those students who have a computer at home the percentages become 87 per cent and 95 per cent. The corresponding figures for school computer use were 83 per cent and 92 per cent respectively (or 84 and 93 per cent of this with access to a computer). The percentages using only Macintosh computers at home were 2.4 per cent in Year 6 and 1.3 per cent in Year 10. At school the corresponding figures were 6.8 per cent and 4.2 per cent. Very few students used only a Macintosh at both home and school.

Table 5.9: Computer platforms used by Year 6 and Year 10 Students

Percentages using each platform at home					Percentages using each platform at school				
Windows	Macintosh	Both	Other	None	Windows	Macintosh	Both	Other	None
Year 6									
79.4	2.4	4.1	10.1	4.1	78.5	6.8	4.7	9.3	0.6
(±1.9)	(±0.7)	(±1.0)	(±1.2)	(±1.3)	(±3.8)	(±2.7)	(±1.5)	(±1.5)	(±0.3)
Year 10									
89.8	1.3	3.1	3.1	2.6	80.4	4.2	11.7	2.6	1.1
(±1.3)	(±0.4)	(±0.8)	(±0.7)	(±0.9)	(±4.5)	(±2.1)	(±3.2)	(±0.8)	(±0.5)

Confidence intervals (95%) are shown in parentheses

Computer Applications

As part of the computer-based student survey students indicated the extent to which they used various computer applications. To simplify the representation of these data the index based on days per 20-day working month of application use has been recorded. Table 5.10 records values of the index of use for males and females in Year 6 and Year 10.

Table 5.10: Use of Computer Applications by Students in Year 6 and Year 10

	Male		Female		Persons	
	Mean	Conf. Interval	Mean	Conf. Interval	Mean	Conf. Interval
Year 6 Students						
Play games on a computer	12.51	(±0.56)	11.77	(±0.46)	12.19	(±0.38)
Use the internet to look up information	9.42	(±0.52)	9.12	(±0.53)	9.29	(±0.39)
Use a computer for e-mail or "chatting"	7.74	(±0.57)	9.33	(±0.70)*	8.54	(±0.52)
Use a computer to listen to music or watch DVDs	8.15	(±0.54)	7.62	(±0.49)	7.85	(±0.40)
Use drawing, painting or graphics programs	6.52	(±0.46)	8.49	(±0.40)*	7.47	(±0.35)
Do word processing	6.58	(±0.42)	8.13	(±0.50)	7.34	(±0.37)
Download games or music from the Internet	6.80	(±0.46)	5.03	(±0.46)*	5.89	(±0.36)
Use a computer for programming	5.23	(±0.44)	4.70	(±0.46)	4.96	(±0.35)
Use mathematics, language or other learning programs	4.55	(±0.43)	5.04	(±0.56)	4.76	(±0.37)
Use spreadsheets	2.85	(±0.27)	2.82	(±0.29)	2.81	(±0.20)
Year 10 Students						
Use a computer for e-mail or "chatting"	12.81	(±0.52)	13.30	(±0.47)	13.07	(±0.37)
Use a computer to listen to music or watch DVDs	12.76	(±0.54)	11.33	(±0.55)*	12.09	(±0.47)
Use the internet to look up information	12.43	(±0.51)	11.23	(±0.47)*	11.86	(±0.36)
Download games or music from the Internet	10.41	(±0.53)	7.54	(±0.49)*	9.05	(±0.37)
Do word processing	8.18	(±0.45)	9.38	(±0.44)	8.75	(±0.35)
Play games on a computer	10.50	(±0.52)	5.71	(±0.47)*	8.25	(±0.40)
Use drawing, painting or graphics programs	6.53	(±0.50)	5.75	(±0.42)	6.15	(±0.31)
Use a computer for programming	3.64	(±0.43)	2.20	(±0.26)*	2.96	(±0.26)
Use spreadsheets	2.47	(±0.22)	1.90	(±0.17)*	2.20	(±0.14)
Use mathematics, language or other learning programs	2.06	(±0.25)	1.80	(±0.26)	1.94	(±0.19)

Note: * indicates that the difference between males and females is statistically significant

From Table 5.10 it is possible to identify the most used and least used computer applications. At both Year 6 and Year 10 the three least used applications are computer programming, spreadsheet applications and education programs.

At Year 6 by far the most frequently used application is "playing games on a computer" followed by using "the internet to look up information" and using "a computer for e-mail or chatting". By far the least frequently used application is "using spreadsheets" followed by using "mathematics, language or other learning programs" and then using "a computer for programming" (e.g. Logo or HTML).

Among Year 10 students the most frequently used applications are (and they are used with similar frequency): using a computer for e-mail or "chatting", "downloading games or music from the Internet" and "use the internet to look up information". The least frequently used applications are using "mathematics, language or other learning programs" followed by "using spreadsheets" and using "a computer for programming".

From Table 5.10 it is possible to identify those applications that increase in use between Year 6 and Year 10 and those that decline in use. There is increased frequency of use, in Year 10 compared to Year 6, of using "a computer for e-mail or "chatting", using "a computer to listen to music or watch DVDs" and using "the internet to look up information", "downloading games or music from the Internet", and "doing word processing" (but this last by only a small amount). There is decreased frequency of use, in Year 10 compared to Year 6, of "playing games on a computer", using "mathematics, language or other learning programs", using "a computer for programming", and using "drawing, painting or graphics programs". There is no difference between Year 10 and Year 6 in the low level of "using spreadsheets".

There are some differences in the use of computer applications by males and females. In Year 6, females "use drawing, painting or graphics programs", "do word processing" and "use a computer for e-mail or "chatting" more frequently than males. On the other hand males "download games or music from the Internet" more frequently than females. In Year 10 males "play games on a computer" (and this difference is large), "download games or music from the Internet", "use a computer for programming", "use a computer to listen to music or watch DVDs", and "use the internet to look up information" more frequently than females. Females in Year 10 use a computer to "do word processing" more frequently than males in Year 10. In Year 10 there is no significant difference between males and females in the frequency with which they "use a computer for e-mail or "chatting", "use drawing, painting or graphics programs", "use spreadsheets", or "use mathematics, language or other learning programs". The last three of these applications are used with low frequency by both males and females.

Attitudes to Computers

In the student computer-based survey that accompanied the assessment instrument students responded to four questions about their attitudes to aspects of computing that were taken from the PISA survey of 2003. The percentages of males and females at Year 6 and Year 10 who strongly disagreed or disagreed, agreed and strongly agreed with the statements are recorded in Table 5.11.

In interpreting these data attention is focused on the percentage of students who "strongly agreed" with each of the four statements. The first observation is that males and females from both Year 6 and Year 10 are positive about using computers. The percentages who strongly agreed with the statements ranged from 23 per cent of Year 10 students who strongly agreed with the statement that "I use a computer because I am very interested" to 58 per cent of Year 6 students who strongly agreed with the statement that "I think playing or working with a computer is fun".

The second observation is that males expressed more favourable attitudes to computers than females. This applied to all items except for Year 10 responses to the statement "I lose track of time when I am working with a computer". The strongest differences at Year 6 were on the items "I use a computer because I am very interested" and "I lose track of time when I am working with a computer". At Year 10 the largest difference between males and females were on the items "I think playing or working with a computer is fun" and "I use a computer because I am very interested".

Table 5.11: Attitudes of Year 6 and Year 10 Students towards Computers

	Percentages of Students in Each Response Category (confidence intervals below in parentheses)					
	Males			Females		
	disagree	agree	strongly agree	disagree	agree	strongly agree
Year 6						
It is very important to me to work with a computer	15.0	54.0	31.1	15.6	61.8	22.5
	(±2.2)	(±3.1)	(±2.8)	(±2.2)	(±3.0)	(±2.9)
I think playing or working with a computer is fun	4.1	33.8	62.1	3.9	41.4	54.7
	(±1.4)	(±3.0)	(±3.4)	(±1.2)	(±3.2)	(±3.4)
I use a computer because I am very interested	17.7	42.5	39.8	21.6	49.3	29.1
	(±3.0)	(±3.3)	(±3.1)	(±2.9)	(±3.0)	(±2.8)
I lose track of time when I am working with a computer	17.7	42.5	39.8	21.6	49.3	29.1
	(±3.0)	(±3.3)	(±3.1)	(±2.9)	(±3.0)	(±2.8)
Year 10						
It is very important to me to work with a computer	12.2	46.5	41.3	15.9	55.6	28.5
	(±2.2)	(±3.3)	(±3.7)	(±2.2)	(±3.3)	(±3.4)
I think playing or working with a computer is fun	9.3	49.5	41.1	15.0	58.8	26.2
	(±1.9)	(±3.0)	(±3.8)	(±2.5)	(±3.1)	(±2.6)
I use a computer because I am very interested	23.3	45.7	30.9	36.7	47.3	15.9
	(±2.8)	(±2.6)	(±2.8)	(±3.3)	(±2.9)	(±2.5)
I lose track of time when I am working with a computer	33.9	37.3	28.8	32.4	37.4	30.2
	(±2.7)	(±2.8)	(±2.9)	(±2.9)	(±3.0)	(±2.7)

Confidence intervals (95%) are shown in parentheses

Familiarity with Computers and ICT literacy

In Chapter 4 the influence of student characteristics and jurisdiction on student ICT literacy is examined, using multiple regression analysis. That analysis provides an indication of the net effect of each variable or block of variables 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. The analysis also indicates the percentage of the variance explained by the blocks of variables on ICT literacy. Greater detail about the procedure is provided in Chapter 4.

In this chapter that analysis is extended by adding variables reflecting student familiarity with ICT. These variables reflect the years of using a computer[21], days each month of home computer use[22], days each month of school computer use and attitudes to computers (based on responses to three items concerned with working with computer, feeling that playing or working with a computer is fun, and being interested in using computers[23]).

In the analysis student characteristics were entered as block one, items concerned with familiarity with computers are entered as block two and jurisdictional variables are entered as block three. This is done so that the influence of computer familiarity can be examined after allowing for the effects of student characteristics and so that the effects of jurisdictional differences can 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 5.12. 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 accounts for 22 per cent of the variance in student ICT literacy scores. It can be observed that student background accounts for 12 per cent of the variance in ICT literacy scores in Year 6 and 7 per cent of the variance in ICT literacy scores in Year 10. Familiarity with computers accounts for 8 per cent of the variance in ICT literacy scores in Year 6 and 13 per cent of the variance in ICT literacy scores in Year 10. In other words familiarity is a more important influence for Year 10 students than Year 6 students possibly reflecting a greater range of experiences with computers among students in the higher Year level. In contrast, student background is a more important influence on ICT literacy for Year 6 students than Year 10 students. For both Year 6 and Year 10 only between 1 and 2 per cent of the variance in ICT literacy is associated with the jurisdiction in which the student lived and attended school. This reflects the greater variation between students within each jurisdiction than between jurisdictions.

Among the student background characteristics the strongest influence on ICT literacy is socioeconomic background. The net difference between the average ICT literacy scores of Year 6 students whose parental occupational group is classified as "unskilled manual, office and sales" and students whose parental occupational group is "senior manager or professional" was 73 scale points. In Year 10 the corresponding difference is a little less, being just 51 scale points.

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21 On a five point scale from "never", through "less than one year", "one to three years", "three to five years", to "more than five years".

22 Estimated from responses provided by students on a scale from "never", through "less than once a month", "between once a week and once a month", "a few times each week" to "almost every day".

23 The items are "It is very important to me to work with a computer", "To play or work with a computer is really fun", and "I use a computer because I am interested". Students responded on a four point scale from "strongly disagree" through "disagree" and "agree' to "strongly agree". The responses were weighted using coefficients derived from a confirmatory factor analysis.

The net difference between Indigenous and non-Indigenous students is approximately 36 scale points at both Year 6 and Year 10. As noted previously this is a smaller difference than is typically observed in other assessment domains. There is also a net difference between students in remote geographic locations and those in metropolitan locations with the gap being between 22 (Year 6) and 33 (Year 10) scale points. Females score higher than males by approximately 10 scale points at both Year levels.

Table 5.12: Results of Regression Analysis of ICT Literacy on Student Characteristics

	Year 6 Students			Year 10 Students		
Predictor	Regression Coefficient (B)	Conf. Interval	Variance Explained (R squared)	Regression Coefficient	Conf. Interval	Variance Explained (R squared)
Intercept						
b0	**273.8**	±128.6		**905.9**	±138.7	
Block 1 Student background						
Age	-0.8	±10.5	12.5%	**-31.4**	±9.1	7.4%
Sex	**9.5**	±7.7		**10.7**	±7.6	
Indigenous	**-35.3**	±20.8		**-36.4**	±21.8	
Language other than English	**-8.2**	±10.5		-7.0	±9.7	
Senior managers & professionals	**73.2**	±11.9		**51.1**	±12.6	
Managers & associate professionals	**47.9**	±10.2		**30.5**	±10.7	
Tradespeople, skilled office, sales service	**25.5**	±9.4		**17.7**	±10.5	
Provincial location	**-14.7**	±12.0		**-2.4**	±11.9	
Remote location	**-22.3**	±19.9		**-33.1**	±24.5	
Block 2 Computer familiarity						
Computer experience	**8.0**	±3.0	7.6%	**13.1**	±3.2	13.0%
Home usage	**1.5**	±0.5		**2.2**	±0.5	
School usage	**1.1**	±1.0		0.7	±0.7	
Attitudes to computers	**13.1**	±4.6		**6.4**	±4.4	
Block 3 Jurisdiction (compared to Queensland students)						
New South Wales	**28.5**	±14.5	1.6%	**22.4**	±14.9	1.3%
Victoria	**39.6**	±14.9		**26.3**	±13.8	
South Australia	**27.3**	±14.8		9.5	±14.2	
Western Australia	4.7	±10.9		-9.6	±13.0	
Tasmania	**35.6**	±19.5		15.3	±15.9	
Northern Territory	13.6	±20.3		-3.2	±28.9	
Australian Capital Territory	**34.4**	±21.8		**34.5**	±19.6	
Full model			21.7%			21.7%

Notes:
Regression coefficients in **bold** are significant (a< .05).
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.

It is interesting that the various aspects of computer familiarity had such an influence on ICT literacy. On the basis of the data in Table 5.12 the net difference (meaning other aspects being the same) between a person having used a computer for “one to three years” and having used a computer for “three to five years”(i.e. one point on the scale) is between eight (Year 6) and 13 scale points (Year 10). For every five additional days on which a computer is used per month there is a net effect on ICT literacy of between seven (Year 6) and 11 (Year 10) scale points. Days of school use have less of an impact being less than six points in Year 6 and less than four points in Year 10 (which is not statistically significant). Attitudes to computers have a stronger impact on ICT literacy at Year 6 than at Year 10 but the magnitude is harder to interpret in concrete terms.

Table 5.12 also displays the net effects for jurisdictions. Overall, it can be seen that the net differences among jurisdictions in this table are smaller than in the corresponding Table 4.18. This is because some of the differences among jurisdictions are a consequence of differences in computer familiarity. The analyses reported in Table 5.12 make allowance for differences in computer familiarity. This does not mean that the originally reported differences are not real but simply that they can be interpreted as partly reflecting differences in familiarity with computers.

In Year 6 the jurisdiction that is most different from the reference jurisdiction (Queensland) is Victoria, followed by Tasmania, the Australian Capital Territory, New South Wales and South Australia. However the net effect for Victoria in Table 5.12 is 40 points compared to 50 points in the results in Table 4.18 where no allowance is made for computer familiarity. Victorian students have greater access to computers at home and school than their peers in Queensland and hence the adjustment has narrowed the gap.

In Year 10 the jurisdiction that is most different from Queensland is the Australian Capital Territory, followed by Victoria, and then New South Wales. The net effect for the Australian Capital Territory is 34 points compared to the effect of 38 points when no adjustment for computer familiarity is made.

Concluding Comments

There are differences in the extent to which students in Years 6 and 10 have the opportunity to become familiar with computers. These differences are most evident in the differences in home computer usage between socioeconomic groups and in school computer usage among Year 10 students. Furthermore these differences appear to impact on ICT literacy scores and contribute to part, but not all of, the variations in ICT literacy among students. There is an argument that can be sustained by the results of the analyses of data in this chapter that reducing the variations in ICT literacy among school students will require some attention to differences in familiarity and therefore in access to computers. It is also evident that students vary considerably in the computer applications that they use. Those patterns of use differ between Year 6 and Year 10, and between males and females. 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. However, there was much less frequent use of applications that involved creating, analysing or transforming information. The lack of use of these types of application appears to be reflected in the aspects of ICT literacy that are less evident in the responses of students to the tasks that they were asked to complete.

Chapter 6
Conclusion

Over a short period of time ICT has become a pervasive part of society that has changed the ways in which people communicate, altered the ways in which data are accessed and processed, and redefined the bases of many occupations. Proficiency in ICT has become important for life in modern society and developing ICT literacy has become an important goal of many school systems. In Australia the national goals for schooling include the goal 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: Goal 1.6).*

Sometimes the view is expressed that young people use ICT frequently and with such facility that their development of ICT literacy takes place through the regular activities in which they engage. Overall, young people are frequent users of ICT and adults who have not grown up with contemporary ICT tend to assume that young people understand a great deal about how, when and why to apply those technologies. The results of this assessment survey indicate that ICT literacy is not developed to a uniformly high level among school students. For that reason they also suggest that monitoring ICT literacy should continue to be an important element of a National Assessment Program. Although there is evidence from this survey and other sources that indicates a high level of use of ICT by school students, it appears that there are aspects of using ICT for communicating, creating and sharing information that are learned through systematic teaching rather than incidental use.

Defining ICT Literacy

ICT literacy is defined in a variety of ways from those definitions that emphasise computer skills and knowledge of computer systems through those definitions that stress information processing capacities to those definitions that focus broadly on associated research and inquiry methods. The definition adopted by MCEETYA as the basis for its National Assessment Program emphasises real-world application to relatively high order processes in a range of contexts. It defines 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).

It is recognised that ICT literacy is a broader concept than computer literacy but in this assessment the focus is on the use of computers. One important reason for this focus is that there is a reasonable basis for viewing computer literacy as one construct or dimension. The results of the assessment support the proposition that there is one construct underpinning the computer based tasks that form the basis of the assessment and that this can be called computer literacy. There is no certainty that one construct would underpin a range of other information technologies. On the basis of informal observation one would not necessarily expect that young people who are adept at using mobile telephones for text messaging and other applications would necessarily be proficient users of computer technologies. In addition, learning about and with computers is a common experience to which one could reasonably expect students to have had deliberate and considered exposure in schools. Other forms of ICT are currently less closely connected to what happens in school and are less widely recognised as the business of schools.

The accepted definition of ICT literacy in the MCEETYA National Assessment Program brings into focus the relationship between computer skills and computer-based communication. The data from the national assessment show that a high proportion of Year 6 and 10 students can complete concrete, skills-based computer tasks using conventional software. A smaller proportion of Year 6 and 10 students are able to use software functions creatively to reconstruct information for particular communicative purposes. In particular, a relatively small proportion of students show evidence of planning in the structure and in the use of software features such as formatting of their information products. It is likely that simply providing students with the opportunity to complete assignment work using computers does not result in them developing understandings of how the ICT medium and communicative conventions can be applied to support the communicative intention of their work.

The data show significant growth in ICT literacy between Year 6 and Year 10 independent of other influences such as frequency of and attitudes towards computer use that were measured in the student survey. This suggests that student learning may be influenced by their exposure to school ICT programs and those teaching programs that focus on planning and implementing specific communicative tasks using computers are likely to improve students' facility in this area. As ICT increasingly utilises automated applications (such as automatically correcting spelling or saving files with multiple retrieval references), the importance of planning and consideration of communicative purpose relative to skills application is likely to assume increased importance.

Factors Associated with ICT Literacy

Student background characteristics are related to ICT literacy and the patterns of those relationships are similar in Year 6 and Year 10. Socioeconomic background is the characteristic that has the largest effect on ICT literacy. In Year 6, 32 per cent of students whose parents are from the "unskilled manual, office and sales" occupational groups attain the proficient standard compared to 68 per cent of students whose parents are from the "senior managers and professionals" occupational group. In Year 10 the corresponding figures are 49 per cent and 75 per cent. These are manifestations of a substantial difference in an important outcome of school education that 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, 30 per cent of Indigenous students attained the proficient standard compared to 50 per cent of non-Indigenous students. At Year 10, the corresponding percentages were 35 per cent and 62 per cent. There was also evidence of disadvantage in the development of ICT literacy, in both Year 6 and Year 10, for students from remote locations.

The data relating to ICT literacy achievement across socioeconomic, Indigenous and non-Indigenous and school location groups largely parallel those in literacy, numeracy, civics and citizenship and science and, as in those learning areas, consideration should be given about how best to reduce the achievement divide associated with these student background factors.

There are small differences between males and females at Year 6 (more females than males attained the proficient standard by seven percentage points) but not at Year 10 and there are no differences at all between students for whom a language other than English was mainly spoken and other students.

Students' experience of using computers and the frequency with which they report using computers at home (at both Year 10 and Year 6) and school (but a smaller influence at Year 10 than Year 6) influenced their ICT literacy. Not surprisingly there is an effect of familiarity with computers that affects ICT literacy. In these data there is support for the proposition that greater access to computing resources results in higher levels of ICT literacy.

In addition there is an association between attitudes to computers and ICT literacy. Students who are favourably disposed to working with computers attain 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.

At Year 6, when the comparisons among jurisdictions including confidence intervals are taken into account, there appear to be three groups of jurisdictions in terms of ICT proficiency. Significantly more Victorian students attained the proficient standard (58 per cent) than the national level of 49 per cent. There was no significant difference between national attainment of the proficient standard and the performance of students in Tasmania, New South Wales and South Australia (49 to 52 per cent). In Queensland and Western Australia the proportion of students attaining the proficiency level was significantly lower (38 to 40 per cent) than the Australian average. Although the percentage of students attaining the proficient standard in the Australian Capital Territory (58 per cent) appear to be similar to the percentage in Victoria the difference from the national attainment is not statistically significant and one cannot be certain of the difference. Similarly the percentage of students attaining the proficient standard in the Northern Territory (36 per cent) would appear to be similar to the percentages for Queensland and Western Australia but one cannot be certain that the figure is statistically different form the national attainment at Year 6.

For Year 10 there was no significant difference between the percentage of students attaining the proficient standard in any jurisdiction and the Australian average. The range was from 67 per cent of students in Victoria attaining the Year 10 proficient standard to 49 per cent in the Northern Territory and 56 per cent in Western Australia but these differences were not statistically significant.

Summary

The National Assessment Program in ICT Literacy for 2005 was computer-based and based on the completion of specific skills and the conduct of larger tasks using authentic applications of software. The assessment operationalises a definition of ICT literacy as accessing, managing, integrating and evaluating information.

Overall, the results indicate that there is variation among students in ICT literacy. One should not assume that students are uniformly becoming adept because they use ICT so widely in their daily lives. The results of the assessment survey suggest that students use ICT in a relatively limited way and this is reflected in the overall level of ICT literacy. Communication with peers and using the internet to look up information are frequent applications but there is much less frequent use of applications that involve creating, analysing or transforming information. Lack of familiarity with these latter types of application appears to be reflected in students' ICT literacy.

Overall, 49 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-one 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 between Year 6 and Year 10 suggesting that considerable growth in ICT proficiency takes place over these four years. Within each Year level there are differences associated with socioeconomic background, Indigenous status and remote geographic locations (compared to metropolitan locations).

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Appendix 1
Survey Design and Sampling Procedures

Sampling

The target populations for the study were Year 6 and Year 10 students enrolled in schools across Australia. The sample design of the *National Assessment Program - Information and Communications Technology Literacy* 2005 was a two-stage stratified cluster sample design, similar to that used by international assessments such as the Trends in International Mathematics and Science Study (TIMSS) and the OECD Programme for International Students Assessment (PISA). The first stage consists of a sample of schools, explicitly stratified according to state and sector and implicitly stratified by location. Within strata schools were selected with a probability proportional to size. The second stage consists of a random sample of 15 students from the target year level in sampled schools. Samples were drawn separately for Year 6 and Year 10.

The Sampling Frame

The national school sampling frame is a comprehensive list of all schools in Australia, developed by the Australian Council of Educational Research (ACER) by coordinating information from multiple sources, including the Australian Bureau of Statistics and State and Territory education department databases.

School exclusions

For the purpose of this study, only schools containing Year 6 or Year 10 students were used. In addition, some schools were excluded from the possibility of being sampled. Schools excluded from the target population included non-mainstream schools (such as schools for students with intellectual disabilities or hospital schools), schools with fewer than five students in the target year levels and very remote schools. These exclusions account for 1.8 per cent of the Year 6 population and 0.8 per cent of the Year 10 population.

Sample Design

For both the year 6 and year 10 samples, sample sizes were determined that would provide accurate estimates of achievement outcomes for all states and territories (with 95 per cent confidence limits of +/- 0.15 standard deviations to +/-0.2 standard deviations for estimated means). This required an effective sample size (i.e., the sample size of a simple random sample that would produce the same precision as the complex sample design) in the larger states of around 200 students. A smaller sample size was required in the smaller states and territories because of the finite population correction factor (i.e. as the proportion of the total population surveyed approaches 100 per cent the precision of the sample increases for a given sample size). Further detail of the sample design is provided in the Information and Communications Technologies Literacy Survey 2005 Technical Report.

Table A1.1shows the population of schools and students (net of schools excluded from the target population) and the planned sample.

Table A1.1: Year 6 and 10 Target Population and Planned Samples by State and Territory

	Year 6				Year 10			
	Population		Planned Sample		Population		Planned Sample	
	Schools	Students	Schools	Students	Schools	Students	Schools	Students
NSW	2368	87905	41	591	779	81715	41	608
VIC	1841	68235	41	593	545	60720	40	600
QLD	1385	54885	41	596	443	51739	40	600
WA	877	27749	41	598	316	27862	41	606
SA	628	19373	42	603	220	18966	41	606
TAS	235	6703	31	445	100	6153	30	450
ACT	140	4721	16	234	35	4709	15	225
NT	104	2896	16	239	33	2047	15	225
Australia	7578	272467	269	3899	2471	253911	263	3920

Structural Differences in State and Territory Education Systems

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 *National Assessment Program - Information and Communications Technology Literacy*. 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 A1.2 shows the effect that the structural difference in Australian state and territory education systems have on the ages of students in the target populations.

Table A1.2: Average Age at Assessment and Average Time at School by State and Territory

	Year 6		Year 10	
	Average age at assessment	Average time at school	Average age at assessment	Average time at school
NSW	12 yrs 0mths	5yrs 11mths	16 yrs 0mths	9yrs 11mths
VIC	12yrs 1mths	6yrs 9mths	16yrs 1mths	10yrs 9mths
QLD	11yrs 6mths	5yrs 10mths	15yrs 6mths	9yrs 10mths
SA	11yrs 11mths	6yrs 8mths	15yrs 10mths	10yrs 7mths
WA	11yrs 5mths	5yrs 10mths	15yrs 5mths	9yrs 10mths
TAS	12yrs 2mths	6yrs 9mths	16yrs 2mths	10yrs 9mths
NT	11yrs 10mths	6yrs 5mths	15yrs 9mths	10yrs 4mths
ACT	12 yrs 0mths	6 yrs 8mths	16 yrs 0mths	10 yrs 8mths

Table A1.2 shows that there is 9 month difference in average age at testing between students in Western Australia (the 'youngest' state) and students in Tasmania (the 'oldest' state). Students in Western Australia and Queensland had also experienced almost one year of formal schooling less than students in Victoria and Tasmania.

First sampling stage

The school sample was selected from all non-excluded schools in Australia which had students in Year 6 or Year 10. Stratification by state was explicit, resulting in separate samples being drawn for each state. Stratification by sector and school size was implicit, resulting in the schools within each state being ordered by size (according to the number of students of the target year level) within a grouping by sector. The selection of schools was carried out using a systematic probability-proportional to size (PPS) method.

Replacement schools

As each school was selected, the next school in the sampling frame was designated as a replacement school for use should the sampled school not participate. The school previous to the sampled school was the second replacement. It was used if neither the sampled school nor the first replacement participated. In some cases (such as secondary schools in the Northern Territory) there were not enough schools available for the replacement samples to be drawn. Because of the sorting of each explicit stratum by sector and size, the replacement schools were generally similar (with respect to size, state and sector) as the school for which they were a replacement.

Second sampling stage

The second stage of sampling a random sampling technique was used to select students within sampled schools. In most cases, 15 students, with three nominated replacements, were sampled from each sampled school. In schools where 15 or less students were available at the target year level, all students were automatically selected. In schools where more than 15 students were enrolled, students were randomly sampled with equal probability of selection.

In the case of small schools, two schools were combined to make a pseudo-school group prior to sampling. For example, two schools with 13 and 15 Year 6 students respectively might be combined into a single pseudo school of 28 students. This was to maximise the number of students selected per school (the sample design was based on 15 students per school) and to minimise any unintended bias introduced through the non selection of small schools. Pseudo-schools were treated like other schools and had equal probability of selection during sampling.

Participation

Student exclusions

Within the sampled classrooms, individual students were eligible to be exempted from the assessment on the basis of:

- **Functional Disability:** Student has a moderate to severe permanent physical disability such that he/she cannot perform in an assessment situation.
- **Intellectual Disability:** Student has a mental or emotional disability and is cognitively delayed such that he/she cannot perform in the assessment situation.
- **Limited Assessment Language Proficiency:** The student is unable to read or speak the language of the assessment and would be unable to overcome the language barrier in the assessment situation. Typically a student

who has received less than one year of instruction in the language of the assessment would be excluded.

In this survey school principals tended to exclude students with disabilities from the student list provided. Consequently these students were not presented for the assessment. The number of student-level exclusions at Year 6 was 134 and at Year 10 the number was 189. The total student population exclusion rate was 3.6 per cent at Year 6 and 4.8 per cent at Year 10.

Participation rates

The Year 6 Australian school participation rate was 99% including replacement schools. Excluding replacement schools, the school participation rate was 95%. At Year 10, the Australian school participation rate was 97% including replacement schools. Excluding replacement schools, the school participation rate was 91%. Tables A1.3 and A1.4 detail Year 6 and 10 school refusals and participation information, including the final participation rate for the states and territories.

Table A1.3: Year 6 Numbers and Percentages of Participating Schools by State and Territory

	Sample	Excluded Schools	Eligible Schools	Participating Schools - Sampled Schools	Participating Schools - Replacement Schools	Non - Participating Schools (Refusals)	Total Number of Participating Schools	School Participation Rate*
NSW	41	0	41	37	1	3	38	93%
VIC	41	0	41	40	1	0	41	100%
QLD	41	0	41	39	2	0	41	100%
SA	41	0	41	41	0	0	41	100%
WA	41	0	41	41	0	0	41	100%
TAS	31	0	31	31	0	0	31	100%
NT	16	0	16	15	1	0	16	100%
ACT	16	0	16	10	6	0	16	100%
Aust	268	0	268	254	11	3	265	99%

* Participating replacement schools are included.

Table A1.4: Year 10 Numbers and Percentages of Participating Schools by State and Territory

	Sample	Excluded Schools	Eligible Schools	Participating Schools - Sampled Schools	Participating Schools - Replacement Schools	Non - Participating Schools (Refusals)	Total Number of Participating Schools	School Participation Rate*
NSW	41	0	41	35	4	2	39	95%
VIC	40	0	40	39	1	1	40	100%
QLD	40	0	40	35	4	1	39	98%
SA	41	1	40	39	1	0	40	98%
WA	41	0	41	38	2	1	40	98%
TAS	30	0	30	30	0	0	30	100%
NT	15	0	15	11	0	4	11	73%
ACT	15	0	15	13	2	0	15	100%
Aust	263	0	263	240	14	9	254	97%

* Participating replacement schools are included.

Of the eligible sampled students, 96 per cent of Year 6 students and 93 per cent of Year 10 students completed the assessment. Tables A1.5 and A1.6 detail the Year 6 and 10 student, absentee and participation information, including the final student and participation rates for the states and territories.

Table A1.5: Year 6 Numbers and Percentages of Participating Students by State and Territory

	Number of sampled students in participating schools	Number of Absentees (including parental refusal)	Number of Participating students	Student Participation Rate*
NSW	591	57	534	90%
VIC	593	18	575	97%
QLD	596	22	574	96%
SA	598	7	591	99%
WA	603	33	570	95%
TAS	445	-2	447	100%
NT	234	3	231	99%
ACT	239	15	224	94%
Australia	3899	153	3746	96%

* Percentage of participating eligible (non-excluded) students in the final sample.

Table A1.6: Year 10 Numbers and Percentages of Participating Students by State and Territory

	Number of sampled students in participating schools	Number of Absentees (including parental refusal2)	Number of Participating students	Student Participation Rate1
NSW	608	67	541	89%
VIC	600	7	593	99%
QLD	600	38	562	94%
SA	606	25	581	96%
WA	606	49	557	92%
TAS	450	22	428	95%
NT	225	63	162	72%
ACT	225	22	203	90%
Australia	3920	293	3627	93%

* Percentage of participating eligible (non-excluded) students in the final sample.

Survey Implementation

The administration of the assessment, from the first point of contacting schools after sampling through to the preparation of the data for analysis, contains a number of steps that have to be undertaken by the contractor or the school. These are listed in order in Table A1.7 and further described in this chapter.

Contact with schools

The field administration of the National Assessment Program - Information and Communications Technology literacy required several approaches to the sampled schools to request or provide information:

- The initial approach to the principals of the sampled schools to inform them of their selection. This included a request to name a School Contact, who would coordinate the assessment in the school, and a list of all of the Year 6 or Year 10 students in the school in an electronic form that was used to generate the student level sample.
- If the sampled school declined to take part (even with encouragement from an education authority Liaison Officer), the replacement school was contacted.
- ACER drew a random sample of 15 students from the school cohort, and 3 random replacement students to allow for any casual absenteeism. Principals advised ACER if the selection included a student for whom the parent refused to allow participation, or an exempted student. These were replaced by from the remaining school pool.
- School Contacts were sent the *School Contact's Manual* together with notification of the selected students for that school. They were requested to advise the school's preferred dates for testing (electronically via email).
- Copies of the *Test Administrator's Manual* were sent to the School Contact, to inform him/her of the procedures that would be implemented on the test.
- All the assessment materials were provided in electronic form on laptops brought to schools by the Test Administrator on the assessment date. The School Contact was responsible to ensure that an adequate learning area was provided for a mini-lab of laptops to be constructed and also to provide the Test Administrator with the details required in the *Student Participation Form*.
- The final contact with schools was to send them the results for the participating students and to thank them for their participation.

Table A1.7: Procedures for Field Administration

Contractor Activity	School Activity
Contact sampled schools.	
	Complete the Facsimile Response Form and remit the Year 6/10 cohort list in electronic format.
Appoint school contact	
Sample drawn of 15 sampled students and 3 replacement students from the cohort list.	
Notify schools of the selected students and provide them with the *School Contact's Manual* and advise the school of the test administration window and request preferred test dates	
	Confirm the preferred test date
Allocate Test Administrator to the school	
Test Administrator make contact with school to finalise test arrangements and co-ordinate logistics	
Copy of the *Assessment Administrator's Manual* to schools.	
	Make arrangements for the assessment: • Organise an assessment room • Notify students and parents
Test Administrator delivers all test materials and resources to the school and administers the instruments	
	Ensure availability of students and inform Test Administrator regarding absenteeism, refusals and exemptions.
Test Administrator records participation status on the *Student Participation Forms*; complete the *Assessment Administration Form*.	
Test Administrator makes physical backup of all student responses and remits to ACER	
Marking	
Data Entry	
Data Cleaning	
Create and send School Reports to the schools.	

At each of the steps that required information to be sent from the schools, a definite timeframe was provided for the provision of this information. If the school did not respond in the designated timeframe, follow-up contact was made via fax, email and telephone.

In order to ensure the participation of sampled schools, Liaison Officers were appointed for each jurisdiction. The Liaison Officers were expected to facilitate communication between ACER and the schools selected in the sample from their respective jurisdiction. The Liaison Officers helped to achieve a high take-up rate for the assessment, which ensured valid and reliable data.

Information management

In order to track schools and students, databases were constructed. The *sample database* identified the sampled schools and their matching replacement schools and also identified the participation status of each school. The *schools database* contained a record for each participating school and contained contact information as well as details about the School Contact and participating students. The *student database* contained student identification and participation information. The *achievement database* contained the final achievement and student background survey data.

In order to track information in these databases, a system of IDs was used. The *School ID* comprised information about state and sector, as well as whether the school was a sampled or a replacement school, and a school number (unique within each state). The *Student ID* included the School and a student number (unique within each school).

The School Contact

Participating schools were asked to appoint a School Contact to coordinate the assessment within the school. The School Contact's responsibilities were to:

- Liaise with ACER on any issues relating to the assessment;
- Provide ACER with student names for the sampled cohort;
- Schedule the assessment and arrange a space for the session(s);
- Check the *Student Participation Form* from ACER for errors;
- Notify teachers, students, and parents about the assessment according to the school's policies;
- Liaise with the ACER Test Administrator;
- Assist the Test Administrator as necessary;
- Provide information as required for the completion of the administration forms; and
- Arrange for the attendance of replacement students (as sampled) if required.

Each School Contact was provided with a manual (the *School Contact's Manual*) that described in detail what was required as well as providing a checklist of tasks and blank versions of all of the required forms. Detailed instructions were also provided regarding the participation and exclusion of students with disabilities and students from non-English speaking backgrounds.

The Test Administrator

Each school was required to appoint an Assessment Administrator(s). In most cases this was the regular class teacher. This was done to minimise the disruption to the normal class environment.

ACER appointed a Test Administrator to deliver the National Assessment Program - Information and Communications Technology literacy in each school, according to the standardised administration procedures provided in the *Test Administrator's Manual*. The Test Administrator had also to complete the *Student Participation Form* (to record which students participated and which did not) and the *Assessment Administration Form* (to record the timing of the assessment and any problems or disturbances which occurred). The teachers were able to review the *Test Administrator's Manual* before the assessment date and raise any questions they had about the procedures with ACER or the State and Territory Coordinators responsible for the program.

The Test Administrator was expected to move around the room while the students were working to see that students were following directions and answering questions in an appropriate manner. They were allowed to read questions to students but could not help the students with the interpretation of any of the questions or answer questions about the content of the assessment items.

Quality control

Quality control was important to the National Assessment Program - Information and Communications Technology literacy to minimise systematic error and bias. Checks and controls were instituted to ensure that the administration within schools was standardised. These included:

- random sampling of students undertaken by ACER rather than letting schools choose their own students;
- providing detailed manuals;
- asking the Test Administrator to record student participation on the Student Participation Form (a check against the presence or absence of data);
- asking the Test Administrator to complete an Assessment Administration Form which recorded the timing of the assessment and any problems or disturbances which occurred; and
- asking the School Contact to verify the information on the Student Participation Form and the Assessment Administration Form.

Summary

The sampling design and procedures ensured that representative samples of Year 6 and Year 10 students were selected. A low level of exclusions and a high participation rate ensured that the samples were unbiased. Administrative procedures helped to ensure that data of sound quality were collected for analysis.

Appendix 2
Sample Characteristics

This Appendix describes the personal characteristics of the participating students at Year 6 and Year 10. At each year level, the survey adopted the form of a two-stage cluster sample design, similar to that used by international assessments such as the OECD Programme for International Student Assessment (PISA).

The sample was a two-stage (probability proportional to size) cluster design to ensure that each eligible student had an equal chance of being selected in the sample. Identical procedures were followed for the Year 6 and the Year 10 samples. In the first stage schools in each stratum were selected, from within the strata of State or Territory and sector, with a probability proportional to the number of students in the relevant Year level enrolled at that school. In the second stage students (other than those students defined as excluded under PMRT protocols) were selected at random. This involved obtaining from the school a list of all eligible students in the Year level and selecting a random sample from the list. Replacement students were selected in case one or more of the students declined to participate or is absent on the day of testing.

The sample design was for a sample of 7,800 students (3,900 at each of Year 6 and Year 10) from 520 schools (260 at each of Year 6 and Year 10). The achieved sample totalled 3,746 Year 6 and 3,647 Year 10 students from 264 primary and 253 secondary schools across Australia. The participation rates were 96 per cent at Year 6 and 93 per cent at Year 10. The survey took place over a two-month period from 12 September to 14 November 2005.

The data presented in the following tables are weighted to allow inferences to be made about the Year 6 and Year 10 student populations. Any differences in total numbers of students between tables are due to missing data for those variables.

This Appendix reports on age, gender, Indigenous status, language background (country of birth and main language other than English spoken at home), socioeconomic background (parental occupation) and geographic location. The structure of these variables had been agreed to by the Education Ministers as part of the National Assessment Program. The relationships between these personal characteristics data reported in this chapter and the cognitive achievement data are more fully explored in Chapter 4.

Age

MCEETYA protocols mean reporting is against year levels rather than age. Nevertheless age differences can account for some of the observed differences in performance, and system differences in the distribution of ages in a given year level may contribute to observed differences between States and Territories. In the achieved sample of participating students, 56 per cent of the Year 10 students stated they were 15 years old and another 39 per cent said they were 16 years old or older (Table A2.1). At Year 6, 53 per cent of students were 11 years old and 42 per cent were 12 years old or older.

There was some variation in age across the jurisdictions. Compared with the Australian average, there were greater proportions of younger students in Queensland and Western Australia. By way of contrast, there were larger percentages of older students in Tasmania, Victoria, the Australian Capital Territory and New South Wales.

Table A2.1: Age of Students Nationally, by State and Territory and by Year Level

Age in years	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
10 and below	3.7	0.2	0.9	9.8	1.1	13.4	1.0	3.6	0.0
11	53.3	44.9	32.6	82.6	55.7	81.8	19.6	60.7	37.3
12	42.0	53.8	64.4	7.5	42.1	4.5	78.4	32.1	62.7
13 and above	1.1	1.1	2.1	0.1	1.1	0.3	1.0	3.6	0.0
Mean age	11.9	12.1	12.2	11.4	11.9	11.4	12.3	11.9	12.1
Year 10									
14 and below	3.6	0.2	0.1	10.4	0.8	11.0	0.0	3.3	0.0
15	56.3	46.2	37.6	78.5	66.8	83.4	22.6	60.0	40.3
16	38.7	52.3	58.9	10.6	31.7	5.5	76.2	36.7	58.4
17 and above	1.4	1.3	3.3	0.6	0.8	0.0	1.2	0.0	1.3
Mean age	15.9	16.0	16.1	15.5	15.8	15.5	16.3	15.9	16.1

Sex

There were almost equal numbers of males and females in the sample, with males comprising 51 per cent of Year 6 students and 52 per cent of Year 10 students (see Table A2.2). According to Australian Bureau of Statistics data, in 2005 males made up 51 per cent of the population at both year levels. From Table A2.2 it can be seen that there was an over representation of males in Year 10 in New South Wales (58 per cent) and of females in Year 6 in the Australian Capital Territory (58 per cent).

Table A2.2: Percentages of Male and Female Students Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
Male	51.0	53.8	50.4	48.8	45.5	52.4	54.5	48.3	41.7
Female	49.0	46.2	49.6	51.2	54.5	47.6	45.5	51.7	58.3
Year 10									
Male	52.3	58.1	48.7	50.5	49.4	47.7	52.3	53.1	47.4
Female	47.7	41.9	51.3	49.5	50.6	52.3	47.7	46.9	52.6

Geographic Location

For the purposes of this report, ‘geographic location’ refers to whether a student lived in a metropolitan, provincial or remote zone (Jones, 2000).

- **Metropolitan zones** included all State and Territory capital cities except Darwin and major urban areas with populations above 100,000 (such as Geelong, Wollongong and the Gold Coast).
- **Provincial zones** took in provincial cities (including Darwin) and provincial areas.
- **Remote zones** were areas of low accessibility, such as Katherine and Coober Pedy.

Table A2.3: Geographic Location - Percentages of Students Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
Metropolitan	68.0	69.5	70.6	62.7	72.9	71.2	42.3	0.0	98.3
Provincial	30.5	30.4	29.1	36.5	22.0	23.1	57.7	67.9	1.7
Remote	1.5	0.2	0.3	0.8	5.1	5.7	0.0	32.1	0.0
Year 10									
Metropolitan	71.6	76.1	72.4	69.7	69.9	69.1	38.1	0.0	96.1
Provincial	26.4	23.9	27.6	26.9	27.4	25.3	60.7	56.7	3.9
Remote	2.0	0.0	0.0	3.4	2.6	5.5	1.2	43.3	0.0

Approximately 70 per cent of the students in the National Assessment of ICT Literacy lived in metropolitan areas (see Table A2.3). Almost 30 per cent lived in provincial areas, while only one to two per cent lived in remote areas.

There were some variations among the States and Territories in the distribution of students across metropolitan, provincial and remote areas. Almost all students in the Australian Capital Territory lived in metropolitan areas, compared with 42 per cent of Year 6 students and 38 per cent of Year 10 students in Tasmania and none in the Northern Territory (Darwin is classified as a provincial city). The Northern Territory had the greatest number of students in remote areas (32 per cent at Year 6 and 43 per cent at Year 10), followed by Western Australia (6 per cent at Year 6 and Year 10).

Indigenous Status

Six per cent of the Year 6 students and three per cent of the Year 10 students sampled identified themselves as being Aboriginal or Torres Strait Islanders (see Table A2.4). The highest percentages of Indigenous students were in the Northern Territory (21 per cent of Year 6 students and 13 per cent of Year 10 students).

Table A2.4: Indigenous Status - Percentages of Students Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
Non-Indigenous	93.5	91.4	95.2	93.5	97.8	94.6	90.8	78.6	98.3
Indigenous	6.5	8.6	4.8	6.5	2.2	5.4	9.2	21.4	1.7
Year 10									
Non-Indigenous	97.0	97.8	98.4	95.0	97.0	96.1	92.9	87.1	100.0
Indigenous	3.0	2.2	1.6	5.0	3.0	3.9	7.1	12.9	0.0

Indigenous students make up 17 per cent of students from remote locations, eight per cent of those from provincial locations and three per cent of those from metropolitan locations.

Language Background

As shown in Table A2.5 about 25 per cent of sampled students came from homes in which languages other than English were spoken (in place of or in addition to English). Tasmania had the smallest percentage of students from such homes (11 per cent of Year 6 students and 6 per cent of Year 10 students), while Victoria had the largest percentage (34 per cent of Year 6 students and

33 per cent of Year 10 students) followed closely by New South Wales (29 per cent of Year 6 students and 32 per cent of Year 10 students).

Table A2.5: Percentages of Students Speaking a Language Other than English at Home Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
English	74.3	71.0	66.0	83.6	78.0	79.5	88.8	75.9	76.7
Other than English	25.7	29.0	34.0	16.4	22.0	20.5	11.2	24.1	23.3
Year 10									
English	73.7	68.0	66.8	81.9	82.5	79.6	94.1	75.0	69.2
Other than English	26.3	32.0	33.2	18.1	17.5	20.4	5.9	25.0	30.8

Country of Birth

Six per cent of the Year 6 students and nine per cent of the Year 10 students were not born in Australia or a predominantly English-speaking country (see Table A2.6). The percentage of Year 6 students born outside Australia varied from two per cent in Tasmania to eight per cent in the Victoria. At Year 10 the percentage varied from two per cent in Tasmania to 12 per cent in Victoria.

Table A2.6: Percentages of Students from Different Countries of Birth Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
Australia / English	94.5	94.0	92.2	96.2	97.4	95.5	98.0	96.6	93.3
Other	5.5	6.0	7.8	3.8	2.6	4.5	2.0	3.4	6.7
Year 10									
Australia / English	91.3	90.2	87.8	94.6	95.9	91.8	97.6	90.3	87.2
Other	8.7	9.8	12.2	5.4	4.1	8.2	2.4	9.7	12.8

Socioeconomic Background

Information about parental education and parental education was obtained to provide an indicator of socioeconomic background. In practice it was not possible to use information about parental education because a very high percentage of students indicated that they did not know their parents' educational attainment (33 per cent of Year 6 students and 13 per cent of Year 10 students). However, only a small percentage of students did not provide a response to the question about parental occupation for at least one of their parents (six per cent of Year 6 students and six per cent of Year 10 students). Consequently, parental occupation was used as the only indicator of socioeconomic background. This indicator has a stronger tradition as an indicator of socioeconomic background than parental education.

The parental occupation variable used in this report is a combined variable, indicating the higher occupation grouping into which either parent fell. This variable is based on questions which asked for both the name of the job the student's mother and father did and a description of what work they did in the job.

The distribution of parental occupations was different for Year 6 and Year 10 students. Around 25 per cent of Year 6 students, compared to 16 per cent of Year 10 students reported that their parents' highest occupation was in the group of unskilled labourers, office, sales and service staff (see Table A2.7). Among Year 6 students 29 per cent reported that their parent's occupation was that of a tradesperson or skilled office, sales or service person, 31 per cent had parents who were managers or associated professionals and a final 14 per cent had parents in the senior manager or professionals group. The corresponding percentages for Year 10 students were 27 per cent, 39 per cent and 18 per cent.

Table A2.7: Parental Occupation - Percentage of Students Nationally, by State and Territory and by Year Level

	AUST %	NSW %	VIC %	QLD %	SA %	WA %	TAS %	NT %	ACT %
Year 6									
Unskilled labourers and other staff	24.5	24.7	24.2	25.0	23.2	24.6	30.5	22.2	12.1
Trades & skilled other staff	28.2	26.4	29.1	30.1	28.1	29.2	22.1	37.0	29.3
Other managers and associates	30.3	31.0	30.7	28.7	30.7	28.9	29.5	29.6	36.2
Senior managers and professionals	13.9	14.1	13.5	13.5	15.4	13.5	13.7	11.1	20.7
Not in paid work for 12 months	3.1	3.8	2.5	2.7	2.6	3.8	4.2	0.0	1.7
Year 10									
Unskilled labourers and other staff	15.6	16.1	15.2	14.8	16.0	16.5	22.5	10.3	8.0
Trades & skilled other staff	26.5	27.0	21.7	28.8	29.8	27.3	31.3	31.0	22.7
Other managers and associates	38.4	36.3	41.8	39.8	37.8	36.9	33.8	37.9	38.7
Senior managers and professionals	17.5	18.5	20.3	14.3	13.7	16.5	11.3	17.2	30.7
Not in paid work for 12 months	1.9	2.0	0.9	2.3	2.7	2.8	1.3	3.4	0.0

Summary

The sample of students who completed the national assessment of ICT literacy in 2005 was diverse and spanned the range of the Australian school populations in Year 6 and Year 10. It was a representative sample in terms of the characteristics about which data were gathered. There were some differences in these characteristics among States and Territories and some of these characteristics were associated with ICT literacy. For that reason it is valuable to analyse differences among jurisdictions in ICT literacy in ways that take account of differences in student characteristics as well as reported overall differences. These analyses have been reported in Chapter 4 and Chapter 5.

Appendix 3
Percentage Distributions by Proficiency Level

Table A3.1: Proportion of Years 6 and 10 Students Achieving at or above Specified Proficiency Levels in ICT Performance, 2005 (per cent)

	NSW		Vic		Qld		WA		SA		Tas		ACT		NT		Aust	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Year 6																		
Level 1 or above	98.6	±1.4	99.8	±0.5	97.9	±1.7	98.8	±1.3	99.5	±0.8	98.9	±1.1	99.5	±1.5	93.4	±9.4	**98.8**	**±0.5**
Level 2 or above	89.5	±3.3	91.4	±3.8	80.7	±4.8	82.8	±4.7	89.6	±3.6	89.7	±5.1	91.5	±4.9	75.8	±12.2	**87.4**	**±1.6**
Level 3 or above	50.5	±16.6	57.9	±6.3	37.7	±5.3	39.6	±5.4	51.7	±5.0	48.9	±9.0	58.4	±12.5	36.0	±10.0	**48.6**	**±3.0**
Level 4 or above	8.7	±3.7	10.5	±3.5	4.1	±1.8	4.6	±2.0	9.0	±3.5	8.4	±4.3	12.9	±6.7	2.8	±2.6	**7.8**	**±1.6**
Level 5 or above	0.1	±0.2	0.1	±0.3	0.1	±0.3	0.2	±0.8	0.3	±0.7	0.4	±1.1	0.1	±0.8	0.0	±0.0	**0.1**	**±0.1**
Level 6 or above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
Year 10																		
Level 1 or above	100.0	±0.0	100.0	±0.0	100.0	±0.0	100.0	±0.0	100.0	±0.0	100.0	±0.0	100.0	±0.0	100.0	±0.0	**100.00**	**±0.0**
Level 2 or above	99.7	±0.4	99.6	±0.6	99.6	±0.8	99.8	±0.5	99.2	±0.6	99.3	±1.0	100.0	±0.0	99.1	±2.1	**99.6**	**±0.2**
Level 3 or above	92.9	±2.5	94.1	±1.9	94.3	±2.8	90.7	±4.2	93.9	±2.4	91.3	±4.2	96.0	±3.1	85.6	±11.3	**93.2**	**±1.2**
Level 4 or above	61.1	±7.6	66.5	±4.8	59.5	±7.4	55.8	±6.1	61.4	±5.0	56.4	±6.4	65.5	±11.4	48.6	±13.2	**61.2**	**±3.1**
Level 5 or above	11.7	±3.5	17.4	±4.1	10.6	±3.3	8.2	±2.9	12.0	±3.6	9.1	±3.9	18.0	±8.9	7.7	±5.9	**12.3**	**±1.6**
Level 6 or above	0.5	±1.0	0.7	±1.2	0.2	±0.5	0.0	±0.2	0.4	±0.6	0.1	±0.4	0.5	±1.3	0.0	±0.0	**0.4**	**±0.4**

a) Minimum standards such as the benchmarks in literacy and numeracy have not been set for ICT literacy performance. Six proficiency levels and a proficient standard are established. The proficient standard for ICT literacy performance is set at proficiency level 2 for year 6 and level 3 for year 10 (of levels 1 to 6 or above) a challenging level of performance, with students needing to demonstrate more than minimal or elementary skills expected at that year level to be regarded as reaching it. Data represent the proportion of students at or above each proficiency level.

b) The achievement percentages reported in this table include 95 per cent confidence intervals (for example, 80.0 per cent ± 2.7 per cent).

– Nil or rounded to zero.

Table A3.2: Proportion of Years 6 and 10 Students Achieving at or above Specified Proficiency Levels in ICT Performance, by Geolocation, Australia, 2005 (per cent)

	Level 1 or above		Level 2 or above		Level 3 or above		Level 4 or above		Level 5 or above		Level 6 or above	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Year 6												
Metropolitan	99.0	±0.6	88.8	±2.0	51.9	±3.8	9.0	±2.0	0.2	±0.2	-	-
Provincial	98.5	±1.2	85.8	±3.2	42.7	±5.5	5.3	±2.4	0.1	±0.2	-	-
Remote	94.2	±7.7	73.9	±15.1	32.6	±18.9	2.5	±4.2	0.0	±0.0	-	-
All locations	**98.8**	**±0.5**	**87.4**	**±1.6**	**48.6**	**±3.0**	**7.8**	**±1.6**	**0.1**	**±0.1**	-	-
Year 10												
Metropolitan	100.0	±0.0	99.6	±0.3	93.4	±1.4	62.8	±4.1	13.6	±2.3	0.4	±0.5
Provincial	100.0	±0.0	99.9	±0.3	92.8	±2.9	58.6	±5.7	10.1	±3.9	0.4	±0.9
Remote	100.0	±0.0	96.9	±5.0	84.6	±8.0	45.8	±9.7	6.8	±5.0	0.1	±0.6
All locations	**100.0**	**±0.0**	**99.6**	**±0.2**	**93.2**	**±1.2**	**61.2**	**±3.1**	**12.3**	**±1.6**	**0.4**	**±0.4**

a) Minimum standards such as the benchmarks in literacy and numeracy have not been set for ICT literacy performance. Six proficiency levels and a proficient standard are established. The proficient standard for ICT literacy performance is set at proficiency level 2 for year 6 and level 3 for year 10 (of levels 1 to 6 or above) a challenging level of performance, with students needing to demonstrate more than minimal or elementary skills expected at that year level to be regarded as reaching it. Data represent the proportion of students at or above each proficiency level.

b) The achievement percentages reported in this table include 95 per cent confidence intervals (for example, 80.0 per cent ± 2.7 per cent).

c) Geolocation data are based on the MCEETYA Schools Geographic Location Classification and represent student residential location.

– Nil or rounded to zero.

Table A3.3: Proportion of Years 6 and 10 Students Achieving at or above Specified Proficiency Levels in ICT Performance, by Equity Group, Australia, 2005 (per cent)

	Level 1 or above		Level 2 or above		Level 3 or above		Level 4 or above		Level 5 or above		Level 6 or above	
Year 6												
Male students	98.5	±0.7	85.6	±2.6	45.4	±4.9	7.9	±2.0	0.2	±0.3	-	-
Female students	99.0	±0.7	89.3	±2.0	52.0	±4.1	7.8	±2.0	0.1	±0.2	-	-
Indigenous students	93.4	±5.4	74.8	±10.6	29.9	±12.9	1.2	±3.0	0.1	±0.4	-	-
LBOTE students	98.5	±1.2	86.5	±3.7	48.8	±6.2	8.7	±2.6	0.0	±0.0	-	-
All students	**98.8**	**±0.5**	**87.4**	**±1.6**	**48.6**	**±3.0**	**7.8**	**±1.6**	**0.1**	**±0.1**	-	-
Year 10												
Male students	100.0	±0.0	99.7	±0.3	91.9	±1.8	59.6	±4.2	11.6	±2.3	0.4	±0.6
Female students	100.0	±0.0	99.6	±0.4	94.8	±1.7	62.9	±3.5	13.2	±2.3	0.4	±0.5
Indigenous students	100.0	±0.0	97.3	±3.9	79.3	±10.1	35.0	±11.5	5.8	±5.8	0.0	±0.0
LBOTE students	100.0	±0.0	99.4	±0.6	92.0	±2.7	58.6	±5.6	12.8	±3.5	0.6	±1.1
All students	**100.0**	**±0.0**	**99.6**	**±0.2**	**93.2**	**±1.2**	**61.2**	**±3.1**	**12.3**	**±1.6**	**0.4**	**±0.4**

a) Minimum standards such as the benchmarks in literacy and numeracy have not been set for ICT literacy performance. Six proficiency levels and a proficient standard are established. The proficient standard for ICT literacy performance is set at proficiency level 2 for year 6 and level 3 for year 10 (of levels 1 to 6 or above) a challenging level of performance, with students needing to demonstrate more than minimal or elementary skills expected at that year level to be regarded as reaching it. Data represent the proportion of students at or above each proficiency level.

b) The achievement percentages reported in this table include 95 per cent confidence intervals (for example, 80.0 per cent ± 2.7 per cent).

c) Membership of equity groups are based on student responses to the survey questionnaire.

– Nil or rounded to zero.

ACER Staff

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, Juliette Mendelovits, Mark Butler and Melissa Hughes. The Analysis Team comprised Chris Freeman, Hungi Njora with Martin Murphy (sampling) and Yan Bibby (school reports). The Information Technology Team comprised Andrew Guzowski, Daryl Nguyen, Phoo Lai Chan and Otto Von Schrenk. Chris Freeman, Anne Tierney Roberts and Otto Von Shrenk had carriage of school communication.

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