

National Assessment Program
ICT Literacy 2008
Year 6 and Year 10
Technical Report

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CHAPTER 1

INTRODUCTION

Project overview

In 1999, the State, Territory and Commonwealth Ministers of Education, meeting as the tenth Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA), agreed to the *National Goals for Schooling in the Twenty-first Century*. Those national goals for schooling asserted 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). Subsequently, MCEETYA agreed to report on progress toward the achievement of the National Goals on a nationally-comparable basis, via the National Assessment Program. As part of the National Assessment Program, a three-yearly cycle of sample assessments in primary science, civics and citizenship and information and communication technology (ICT) was established.

The first cycle of the National Assessment Program – ICT Literacy was held in 2005 and provided the baseline against which future performance would be compared. The second cycle of the program was conducted in 2008 and was the first cycle where trends in performance were able to be examined. This report describes the procedures and processes involved in the conduct of the second cycle of the National Assessment Program – ICT Literacy (NAP-ICTL08).

National Assessment Program – ICT Literacy

The National Assessment Program – ICT Literacy was based on a definition of ICT Literacy adopted by MCEETYA. ICT literacy was defined as:

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

That definition was elaborated first through a set of six key processes, then three broad strands and then in the form of a progress map that articulated what was meant by progress in ICT Literacy (MCEETYA, 2007). ICT literacy is increasingly regarded as a broad set of generalisable and transferable knowledge, skills and understandings that are used to manage and communicate the cross-disciplinary commodity that is information. The integration of information and process is seen to transcend the application of ICT within any single learning discipline (Markauskaite, 2007; Amtmann & Poindexter, 2008). Common to information literacy are the processes of identifying information needs, searching for and locating information and evaluating the quality of information (Catts and Lau 2008). Most views of information literacy extend these processes to include ways in which collected information can be transformed and used to communicate ideas. ICT literacy has not focused on programming but on knowledge about computer use (computers being seen as an important sub-domain of ICT).

The core of NAP-ICTL08 was an assessment of student ICT Literacy that was computer-based and included authentic applications of real software to larger tasks as well as single tasks. Some tasks were automatically scored and others (those that resulted in information products) were stored and marked by human assessors. The tasks (items) were grouped in thematically linked modules each of which followed a narrative sequence covering a range of school-based and out-of-school-based themes. Each module typically involved students collecting and appraising information as well as synthesising and reframing the information. The assessment involved a number of modules so as to ensure that the assessment instrument assessed what was common to the ICT Literacy construct across a sufficient breadth of contexts.

The assessment in NAP-ICTL08 took account of several developments in the context since 2005: continued growth in student access to information technology; re-iteration of the importance of ICT in education in the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA, 2008); increased focus on changes in the ways young people are prepared for participation in society; and the implementation of the “digital education revolution”.

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

In addition NAP-ICTL08 included a computer-based survey of students’ familiarity with, access to, and use of ICT, and some detail about their use of various computer applications.

Participants in the assessment

The total achieved sample for the survey was nationally representative and consisted of 10,926 students of which 5,604 were from Year 6 and 5,322 were from Year 10. The use of mini-labs at some schools only allowed 18 students to be tested in those schools and because many small schools had fewer than 20 students the number of students assessed per school averaged 18.7 for Year 6 and 18.2 for Year 10. Table 1.1 records the distribution of the achieved sample across the States and Territories for each Year level.

Table 1.1 Achieved ICTL08 sample by State and Territory

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

The assessment format

NAP-ICTL08 made the maximum possible use of school computing resources but in a way that would not substantially alter the student’s experience of the assessment from NAP-ICTL05. The 2008 cycle made use of school computers in 86 per cent of the sampled schools. This was either by providing the school with a laptop computer containing the assessment software and database that could be connected to the school network and function as a server (68 per cent of all schools) or by connecting to a remote server farm through an Internet connection (18 per cent of all schools). In only 14 per cent of schools was it necessary to provide a computer mini-lab

(nine student notebooks connected to a higher specification notebook server) which had been the sole delivery method in the 2005 cycle. In addition, the application functions in the new modules in 2008 were based on Open Office rather than MS Office in order to provide a basis for the free distribution of school release materials.

Reporting of the assessment results

The results of the assessment were reported in the *National Assessment Program – ICT Literacy Years 6 and 10 Report 2008*. A reporting scale for ICT Literacy was established, using methods based on the one-parameter item response theory model (the Rasch model). In 2005, the Year 6 cohort was defined as having a mean scale score of 400 and a standard deviation of 100 scale score units. The Year 10 mean and standard deviation in 2005 were determined by the performance of Year 10 relative to the Year 6 parameters (i.e. a mean for Year 10 of 551 and a standard deviation of 98).

Using equating procedures based on common items, it was possible to record the results for NAP-ICTL08 on the scale that had been established in 2005. Three assessment modules from NAP-ICTL05 had been included in the 2008 assessment along with four new modules. Rasch analysis enabled the new items to be placed on the established ICT literacy scale. Consequently this enabled the results from NAP-ICTL08 to be compared directly with those from NAP-ICTL05. In practice, 39 items performed sufficiently uniformly across both cycles to be used to link the results of the 2008 study to the ICT literacy scale established in 2005. In 2008, the Year 6 mean was 419 (with a standard deviation of 115) and the Year 10 mean was 560 (with a standard deviation of 107).

It was also possible to describe students' ICT literacy in terms of proficiency levels. Six Proficiency Levels were defined in NAP-ICTL05 and descriptions, based on the content of the tasks corresponding to the difficulty range in each level, were developed to characterise typical student performance at each level. As a set, the descriptions represent growth in ICT literacy. The levels are not discrete discontinuous steps but are a method of representing progress. The newly developed assessment modules for NAP-ICTL08 enabled some additional examples of ICT literacy achievement to be added to the progress map but did not require changes to the descriptors themselves.

In addition to deriving the ICT literacy proficiency scale, proficient standards were established in 2005 for Year 6 and Year 10. The proficient standards represent points on the proficiency scale that represent a 'challenging but reasonable' expectation for typical Year 6 and 10 students to have reached by the end of each of those years of study. The proficient standard for Year 6 was defined as the boundary between levels 2 and 3 and the proficient standard for Year 10 was defined as the boundary between levels 3 and 4. In 2008, 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard by demonstrating the ability to "generate simple general search questions and select the best information source to meet a specific purpose, retrieve information from given electronic sources to answer specific, concrete questions, assemble information in a provided simple linear order to create information products, use conventionally recognised software commands to edit and reformat information products" (MCEETYA, 2007: 48). In 2008, 66 per cent of Year 10 students reached or exceeded the Year 10 proficient standard by demonstrating the ability to "generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose, create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose" (MCEETYA, 2007: 48).

Structure of the Technical Report

This report describes the technical aspects of the National ICT Literacy Sample Assessment and summarises the main activities involved in the data collection, the data collection instruments and the analysis and reporting of the data.

Chapter 2 summarises the development of the assessment domain and describes the process of item development and construction of the instruments.

Chapter 3 reviews the sample design and describes the sampling process. Chapter 3 also describes the weighting procedures that were implemented to derive population estimates.

Chapter 4 summarises the field administration and data management procedures, including quality control and the cleaning and coding of the data.

Chapter 5 describes the scaling procedures, including equating, item calibration, the creation of plausible values and the standardisation of student scores.

Chapter 6 examines the process of standards-setting and creation of Proficiency Levels used to describe student achievement.

Chapter 7 discusses the reporting of student results, including the procedures used to estimate sampling and measurement variance, and the calculation of the equating errors used in tests of significance for differences across cycles.

CHAPTER 2

ASSESSMENT DOMAIN AND INSTRUMENT DEVELOPMENT

The assessment domain

The ICT Literacy Assessment Domain used in the 2005 cycle was used, without modification in the 2008 cycle (MCEETYA, 2005)¹. The assessment domain was used as the central reference point for the construction of the assessment instrument. The described achievement scale generated using the 2005 data was used as an indicator of item and task difficulty to inform instrument development but the assessment domain and progress map were used as the substantive basis for instrument construction and the items in the instrument were referenced to the strands in the progress map.

Summary of the assessment domain

For the purpose of this assessment, ICT literacy was defined as “the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society”. The definition draws heavily on the Framework for ICT Literacy developed by the International ICT Literacy Panel in 2003 and the OECD PISA ICT Literacy Feasibility Study (International ICT Literacy Panel, 2002). While 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.

The assessment domain describes ICT literacy as comprising a set of six key processes: accessing information (identifying information requirements and knowing how to find and retrieve information); managing information (organising and storing information for retrieval and reuse); evaluating (reflecting on the processes used to design and construct ICT solutions and judgements regarding the integrity, relevance and usefulness of information); developing new understandings (creating information and knowledge by synthesising, adapting, applying, designing, inventing or authoring); communicating (exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium); and using ICT appropriately (critical, reflective and strategic ICT decisions and considering social, legal and ethical issues).

The assessment domain includes an ICT literacy progress map that describes skills and understandings that are progressively more demanding across levels. The progress map is a generalised developmental sequence that enables information on the full range of student performance to be collected and reported. Student achievement of the different ICT Literacy processes can only be demonstrated by taking into account the communicative context, purpose and consequences of the medium. The ICT Literacy progress map was based on three organising "strands":

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

¹ The assessment domain can be found at:
http://www.mceecdy.edu.au/verve/_resources/NAP_ICTL_2008_Assessment_Domain.pdf
(accessed February 24, 2010)

In the 'Working with information' strand, 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 the 'Creating and sharing information' strand, 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 the 'Using ICT responsibly' strand, 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.

Trend modules

Three of the modules from the 2005 ICTL assessment were included in the 2008 instrument for the purpose of equating the 2008 data to a common scale with the 2005 data. One of these modules, the General Skills Test, included only simulation and multiple-choice assessment items. The other two were Photo Album and DVD day which incorporated conventional simulation, multiple-choice and constructed response items with live application software. Photo Album involved students using software that they would not have encountered previously and DVD day involved the use of a generic web browser and applications from Microsoft Office.

New item development

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

The new modules were as follows.

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

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

The Field Trial

The ICT literacy field trial was completed in March 2008 by 1504 students in 80 schools (40 Year 6 schools and 40 Year 10 schools). The field trial was conducted in New South Wales (21 schools), Queensland (14 schools), South Australia (12 schools), Victoria (21 schools) and Western Australia (12 schools). Three schools originally included in the field trial sample were unable to participate and were replaced by schools with similar geographical and socioeconomic profiles.

The major purpose of the field trial was to test methodologies, systems, documentation and items. Data collected from the field trial informed all facets of the implementation of the main sample.

Table 2.1 Main aspects of NAP-ICT field trial

Component	Aspect	Data considered
School Contact	Information regarding technological capacity, bandwidth	Accuracy of data received pre-trial with onsite experiences Capacity of school to provide onsite support on the day of administration
Administration Procedures	Timing of assessment components Implementation methodologies Data collection strategies Redundancy and backup strategies	All delivery methodologies were field tested In instances where the primary or advised methodology failed, alternative methodologies were implemented Data transfer and back-up strategies were tested and the consistency of the data reviewed Marking methodologies and rubrics were implemented and reviewed in response to observed outcomes
Administration Documentation	Test Administrator training Test Administrators instructions	Completeness of trainer capacity to deal with local situations Completeness of documentation to implement assessments and transfer student response data.
Test Items	Number of items taken to trial of the order of 1.5 times anticipated main sample study Trend items trialled for consistency of performance	All items were trialled and analysed Item fit statistics were reviewed by the steering committee All recommended items were reviewed by the reference group

Assessment system

The software developed by SoNET systems contained all the assessment modules and a management system that confirmed the identity of the selected student, asked basic registration information, assigned each student to the modules appropriate to their Year level (this was random within each Year level) and collected student responses to the survey questions. As was the case in the 2005 assessment, the on-screen environment of the assessment instrument had three main sections: a surrounding border of test-taking information and navigation facilities; a central information section that could house stimulus materials for students to read or (simulated or live) software applications; and a lower section containing the instructional and interrogative text of the assessment items and the response areas for multiple-choice and constructed response items. The assessment items were presented in a linear sequence to students. Students were not permitted to return to previously completed items because, in some cases, later items in a sequence provide clues or even answers to earlier items.

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

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

The score guide

Students completed tasks on computers using software that included a seamless combination of simulated and live applications.

1: Software simulation items

Software simulation items were scored automatically as 0 (incorrect attempt made), 1 (correct attempt made) or 9 (no attempt made). When students completed any attempt (correct or incorrect) for a simulation item they were prompted by the system with an option to “Try Again” on the same item. Only the final attempt (the first, or second if the student chose to “Try Again”) was recorded by the system. This option and the consequent scoring only of the final attempt were explained to students during a tutorial before the assessment. Students had the opportunity to practice both completing items at the first attempt and exercising the “Try Again” option during the tutorial.

2: Live applications

Students completed tasks on computers using live software applications. The information products that resulted from these tasks were stored and marked by human assessors. One of the live applications was concerned with internet use. Students were asked to search for and evaluate information about restricting internet access, take notes and create a presentation addressing the question of whether a youth centre should provide unrestricted internet access. For the first task students were required to read the websites to find advantages and disadvantages of unrestricted Internet access and to use note-taking software to make notes for a presentation. The score guide was based on locating information and using software to make a range of notes (three points), using software to indicate whether notes are "advantages" or "disadvantages" (one point) and citing sources for research notes (one point).

The second task involved using notes and the websites to create a presentation of up to seven slides about unrestricted Internet access that included recommendations. The score guide was based on design and layout of text and graphics (three points); organisation and structure of the flow of information (three points); adaptation of source information for the presentation (four points); providing a relevant recommendation (one point) demonstrating research balance (one point) and citing electronic sources (three points).

One of the elements in the second task referred to the criterion of adaptation of source information. The score guide was as follows:

- Score 0: Large sections of text copied from the resources and notes and pasted with no editing.
- Score 1: Text copied from the resources and notes and pasted with no editing. Some evidence of planning and thought regarding the selection of text is evident. Text may appear cluttered or cumbersome.
- Score 2: Text largely copied from resources and notes and pasted with evidence of minor editing such as punctuation and formatting. Text may appear cluttered or cumbersome.
- Score 3: Relevant sentences have been copied from resources and notes and pasted. Some sentences have been semantically linked with student's own words.
- Score 4: Key points have been included from the resources and notes using some original expression (some copying may still be evident). Key points have been linked and explicated with student's own words.

Student survey

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

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

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

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

A printed copy of the student background survey (it was computer-administered), along with the coding information, can be found in Appendix A.

Summary

The national assessment of ICT literacy in 2008 was based on a definition that emphasised accessing, managing, integrating and evaluating information as well as developing new

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

The format of the ICT literacy assessment in 2008 was the same as in 2005 in that the appearance of material was identical and the method of responding to tasks and saving information products was exactly the same. The assessment instrument used in 2008 was linked to that used in 2005 by the inclusion of three common modules that covered different aspects of the 2005 assessment (general skills, a piece of unfamiliar software and tasks using common utilities). The assessment in 2008 included four new modules: internet use (evaluating arguments about restricting access), school picnic (using a blog to share information), designing a school survey, and installing photo management software on a friend's computer. Each student completed two of these modules as well as two modules from the 2005 assessment.

CHAPTER 3 SAMPLING AND WEIGHTING

Sampling

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

Sample design

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

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

Sampling process

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

In the second stage, 20 students were selected at random from a school-provided list of all eligible students from the year level. At the same time a list of eight replacement students was selected in case one or more of the students was ineligible to participate² or was absent on the day of testing. By selecting students at random from the year level, and by selecting only 20 students per school, the sample had enhanced precision over a sample of the same number of students based on selecting intact classes because the effects of students being in classes similar to each other was reduced.

School exclusions

For the specific purposes 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

² Within the sampled schools, individual students were eligible to be exempted from the assessment on the basis of functional disability, intellectual disability or limited assessment language proficiency.

excluded from the target population included non-mainstream schools (such as schools for students with intellectual disabilities or hospital schools), schools listed as having fewer than five students in the target year levels and very remote schools (except in the Northern Territory). This process replicates the procedures of 2005.

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.

Decisions regarding the exclusion of students on the basis of disability were the prerogative of the relevant school principal. In most cases these reasons were not provided to ACER.

Achieved sample

The total achieved sample for the survey consisted of 10,926 students of which 5,604 were from Year 6 and 5,322 were from Year 10. The use of mini-labs at some schools only allowed for 18 students to be tested in those schools and because many small schools had fewer than 20 students, the number of students assessed per school averaged 18.7 for Year 6 and 18.2 for Year 10. Table 3.1 records the distribution of the achieved sample across the States and Territories for each year level. Details of the social and demographic characteristics of students in the sample are recorded in Appendix B.

Table 3.1: Numbers of Students and Schools in the Achieved Sample

State/Territory	Year 6				Year 10			
	Original sample Schools	sampled	replaced	Students	Original sample Schools	sampled	replaced	Students
New South Wales	46	46	0	842	48	43	5	895
Victoria	47	45	2	898	47	34	13	850
Queensland	49	49	0	949	48	46	2	884
South Australia	45	45	0	865	45	44	1	836
Western Australia	46	45	1	849	43	38	5	805
Tasmania	30	29	1	533	30	29	1	545
Northern Territory	18	18	0	326	13	11	2	189
Australian Capital Territory	18	17	1	342	18	17	1	318
Total Sample	299	294	5	5,604	292	262	30	5,322

Calculating the precision of estimates

For any survey there is a level of uncertainty regarding the extent to which an estimate measured from the sample of students is the same as the true value of the parameter for the population. An estimate derived from a sample is subject to uncertainty because the sample may not reflect the population precisely. If a statistic was estimated from different samples drawn from the

same population of students, the observed values for the statistic would vary from sample to sample. The extent to which this variation exists is expressed as the confidence interval. A 95 per cent confidence interval, for instance, 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 ICTLO8 survey sample design in this study involves clustering, stratification, and disproportionate allocation which mean that it is not appropriate to use the estimates of confidence intervals through standard software procedures because these generally assume a simple random sample and will therefore underestimate the real confidence intervals. The estimates of confidence intervals in this report are based on 'Jackknife' replication methods. In replication methods a series of sub-samples is derived from the full sample, and the statistic of interest is generated for each sub-sample. The variance is then estimated by calculating the variability in the estimate between these sub samples. This technique generates an estimate of the standard error of the estimate and the confidence interval is 1.96 times the standard error.

Weighting

While the multi-stage stratified cluster design provides a very economical and effective data collection process in a school environment, it results in differential probabilities of selection for the ultimate sampling elements, the students. Consequently, one student in the assessment does not necessarily represent the same number of students in the population as another, as would be the case with a simple random sampling approach. To account for differential probabilities of selection due to the design and to ensure proper survey estimates, a sampling weight was computed for each participating student. The ability to provide proper sampling weights was an essential characteristic of the sample design, since appropriate sampling weights were essential for the computation of accurate population estimates.

The overall sampling weight is the product of weights calculated at the two stages of sampling:

- the selection of the school at the first stage; and
- the selection of students within the sampled schools at the second stage.

The First Stage Weight

The first stage weight is the inverse of the probability of selection of the school, adjusted to account for school non-response.

The probability of selection of the school is equal to its Measure of Size (MOS) divided either by the Sampling Interval (SINT) or by 1, whichever is the lower. (A school with a MOS greater than SINT is a 'certain selection', and therefore has a probability of selection of 1. Some very large schools were selected with certainty into the sample.)

The sampling interval is calculated at the time of sampling, and for each explicit stratum it is equal to the cumulative measure of size of all schools in the stratum, divided by the number of schools to be sampled from that stratum. The measure of size for each school is the number of students recorded on the sampling frame at the relevant year level (Year 6 or Year 10).

This factor of the first stage weight is the inverse of this probability, i.e. $SINT/MOS$.

Following data collection, counts of the following categories of schools are made for each explicit stratum:

1. The number of schools that participated in the sample (N_p);
2. The number of schools that were sampled but should have been excluded (N_x); and,
3. The number of non-responding schools (N_n)

Note that $N_p+N_x+N_n$ is equal to the total number of sampled schools from the stratum.

Examples of the second class (N_x) are:

- a sampled school that no longer existed; or,
- a school that following sampling was discovered to have fitted one of the criteria for school level exclusion (e.g. very remote, very small), but which had not been removed from the frame prior to sampling.

In the case of a non-responding school (N_n), neither the originally sampled school nor its replacements participated.

Within each explicit stratum, an adjustment is made to account for school non-response. This non-response adjustment for a stratum is equal to:

$$(N_p + N_n) / N_p.$$

The first stage weight is the product of SINT/MOS and $(N_p + N_n) / N_p$.

$$W_1 = \text{SINT/MOS} * [(N_p + N_n) / N_p].$$

The Second Stage Weight

The second stage weight is the inverse of the probability of selection of the student from the sampled school.

Following data collection, counts of the following categories of students were made for each sampled school:

1. The number of students from the sampled school that participated in the sample (S_p);
2. The number of students from the sampled school that were exclusions (S_x); and,
3. The number of students from the sampled school that did not participate (S_n).

Note that $S_p + S_x + S_n$ equals the total number of students from the sampled school.

The student level non-response adjustment was calculated as $(S_p + S_n) / S_p$.

$$W_2 = (S_p + S_n) / S_p$$

Overall Sampling Weight

The overall sampling weight is simply the product of the weights calculated at each of the two sampling stages:

$$FW = W_1 * W_2$$

The Third Stage Weight: Post-stratification weighting adjustment

The final stage in the weighting process was to compare the sum of the sample weights against known population totals, and adjust the weights to reflect the population totals where necessary. To account for any possible bias by subgroups such as State/Territory and sector, the sum of the sample weights differed from population totals across this dimension and so the post-stratification process was used to adjust the weights. Post-stratification involves adjustments to the final weights to control totals across two or more dimensions, for example the distribution of the school population by State/Territory and sector. Population control totals were obtained from ACER's sampling frame.

Following the three stages of weighting the data described above, the following variables were created:

1. The sum of the final weights split by State/Territory and Sector ($\sum FW$);
2. Total population estimate split by State/Territory and Sector (PE); and,
3. Post-stratification State/Territory by Sector adjustment (PSAdj).

Post-stratification adjustment

The post-stratification adjustment was calculated as:

$$PSAdj = \sum FW / PE$$

Overall Final Sampling Weight with State/Territory and Sector Adjustment

The overall final sampling weight with State/Territory and sector adjustment (FW_{adj}) is simply the product of the final weight and the post-stratification adjustment:

$$FW_{adj} = FW * PSAdj$$

Summary

NAP-ICTL08 was based on a two-stage cluster sample. Schools were selected with a probability proportional to size (the number of students enrolled in Year 6 or Year 10 as appropriate), and disproportionate sampling ratios among strata, from a national stratified sampling frame. Students were selected as simple random sample of 20 students from within each sampled schools. Weights were applied to the sample in order to estimate population parameters and confidence intervals associated with each estimate were computed using replication methods. There was a high level of participation at both school and student level meaning that there is almost no bias in the estimates.

CHAPTER 4 FIELD ADMINISTRATION AND DATA MANAGEMENT

Field administration

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 were undertaken by the contractor and participating schools. These are listed in order in Table 4.1 and further described in this chapter. Associated documents used in the administration are contained in Appendix C.

Table 4.1 Procedures for field administration

Contractor Activity	School Activity
Contact is made via mail with sample schools; request registration details	Schools complete registration details (principal name, school contact nomination etc)
Class and student number breakdown of Yr 6 or Yr 10 students requested	School provides requested information
Computer resource information (including online test for bandwidth capabilities) requested	School contact informs ACER of computer resource availability (including online test information)
Test delivery method for each school and mini-lab/server schedule confirmed	
Test administrators (TAs) for assessment are selected and trained (includes dissemination of TA Manual)	
Liaison with school regarding preferred dates for assessment	
Yr 6 and Yr 10 ICT Literacy assessments are administered	School hosts assessment with TA assistance
Data are cleaned and student artefact based tasks are scored	
Summary reports sent to schools	

Contact with schools

School Contact Officer

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

- Liaise with ACER on any issues relating to the assessment;
- Provide ACER with student names for the selected classes;
- Schedule the assessment and book a room – with an appropriate number of networked computers (if applicable) – for the assessment sessions;
- Notify teachers, students and parents about the test, according to the school's policies;

- Check that all of the computers and the internet link to be used in the test are working, and arrange for the school's network administrator to be at the test room from 8:30am to 10:00am on test day (if school computers were to be used for the test);
- Assist the Test Administrator(s) with final arrangements on test day so that he/she can conduct the assessment sessions.

School Contact Officers were each provided with a manual (the *School Contact Officer's Manual*, see Appendix C) that described in detail what was required as well as providing a checklist of tasks for their reference.

Assessment delivery methods

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

For NAP-ICTL08 the preferred medium of delivery of the assessment was to use school-based computers. This was possible because of developments in the technology available for delivery that had not been available in 2005 and because of the enhanced provision of school computer resources between 2005 and 2008³. In delivering the assessment to schools, three options were provided:

1. Internet access to a remote server

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

2. Connection of a local server to a school network

This delivery method required a sufficient number of co-located networked computers but did not require a connection to the internet. The method required one laptop computer of moderate capacity, with all the assessment resources loaded on it, to be brought to the school by the test administrator. The laptop was connected to the school network and a batch file was run so that it would function as a local server on the school network. After

³ The development of the delivery system to schools was led by SoNET systems and was informed by the results of a series of pilot studies and the field trial. We explored the use of a Remote Desktop Protocol (RDP) connection to the remote server but that was often not possible because of security provisions in school networks and the use of the Next G wireless network was too expensive to implement.

the assessments were connected, the student response files were delivered to ACER using an internet connection (via the “Next G” wireless network).

3. Provision of a mini-lab of computers

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

An important feature of all three delivery methods was that students’ experience of the assessment was identical, regardless of which delivery method was used. There were differences between states and territories, and between primary and secondary schools, in the frequency with which different delivery methods were used. Data about the frequency of use of the alternative methods are shown in Table 4.2.

The data in Table 4.2 indicate that the method involving the connecting of a local server was the most commonly used method being adopted in 68 per cent of schools. Use of an internet connection to a remote server was adopted in 18 per cent of the schools and the mini-lab method was adopted in 14 per cent of the schools.

Table 4.2 Percentages of Schools Utilising Each Available Delivery Method for ICT Literacy Assessment

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

Note: Row percentages are shown for each group

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

Test Administrators

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

Test Administration

Table 4.3 Standard timing of the assessment session.

Session	Year 6	Year 10
Initial administration: registration on system, participation in familiarisation tutorial	15 minutes	15 minutes
General Skills module	15 minutes	15 minutes
Trend Module (Random assignment 1 of 2)	25 minutes	25 minutes
Random Modules (2 x 25 minutes each)	50 minutes	50 minutes
Student Questionnaire	15 minutes	15 minutes

Quality control

Quality control was important to the program in order to minimise systematic error and bias. Strict procedures were set up involving, test development (see Chapter 2), sampling (see Chapter 3), test administration, marking, data entry and cleaning and analysis (see Chapters 5 and 7). In addition to the procedures mentioned in other chapters, certain checks and controls were instituted to ensure that the administration within schools was standardised. These included:

- random sampling of students being undertaken by ACER from lists provided rather than letting schools choose their own students;
- providing detailed manuals;
- provision of 1800 help line for schools and test administrators;
- all Test Administrators being trained in standardised administration procedures;
- all Test Administrators recording student participation on the *Student Participation Form* to check against the presence or absence of data;
- all Test Administrators completing an *Assessment Administration Form* which recorded the timing of the assessment and any problems or disturbances which occurred; and
- Test Administrators being responsible for the transfer of all data to the central server for scoring.

Marking procedures and marker training

Marking and data entry

The marking of both the trial and final survey assessment items took place at the ACER marking centre in Sydney. As all the student survey and achievement data were collected electronically, this assessment program did not require data entry. ACER was able to employ trained markers from the 2005 assessments for the 2008 trial and main survey marking. This assisted in maintaining the consistency of the application of the marking rubric for the trend items.

Marker training

Markers were trained to score all items and tasks. Typically this involved a detailed discussion of the substance of the scoring guides followed by marking and discussion of a selection of samples (typically between five and ten depending on the task) of student work. The training samples were selected to represent both clear examples of the different levels of work, but also to provide examples of work that was difficult to score because they included unconventional or borderline responses. Marking of items did not begin until marking trainers were confident that the group were sufficiently trained on each item.

Quality control

Leading markers conducted random second marking at a rate of ten per cent of work by each marker. In cases where problems were uncovered relating to either marker or item, they were addressed immediately. In addition to this, control marking scripts were seeded as items are delivered to the markers. Markers and leading markers received instant feedback on the marking of control scripts. Previously scored work from the 2005 assessment cycle was included for blind marking of the trend modules.

Data management

Data capture procedures

The data capture method chosen depended on the delivery method used. For instance, when the assessment was delivered using the internet connection to a remote server, the data were written directly into the central database. When the assessment was delivered using a local server notebook (using either school computers or a mini-lab), the student data were stored on the local server notebook and subsequently uploaded to the central database by test administrators. No data were lost using these complimentary methods.

Data cleaning

Following data capture, data cleaning was undertaken to resolve any inconsistencies, such as:

- Inconsistencies between the student participation data and the achievement and background data. These could include:
 - Achievement data being available for a student but the student being absent according to the student participation information;
 - A student completing a module (or the assessment) according to the student participation data but no achievement data being available in the test; and,
 - Achievement data being available for students with Student IDs that should not be in the database.
- Inconsistencies between the marking key and expected response patterns.
- Inconsistencies within the background data, such as:
 - A student indicated that they, their father or mother had not been born in a country other than Australia but a verbatim response was given to 'please specify country';
 - A student indicated that they, their father or mother did not speak a language other than English at home but a verbatim response was given to 'please specify language';
 - Age data were outside the expected range (10-13 for Year 6 and 14-17 for Year 10); and,

Table 4.4 Summary of Analysis applications

	Application	Analyses	Outcomes
1	SPSS	Data cleaning Crosstabs by group and module Response frequencies	Identify any invalid responses Resolve duplicates and interrupted sessions
2	RUMM	Initial IRT analysis	Initial Item parameters Identification of reverse thresholds Identification of potential item dependencies Analysis of DIF in defined groups Analysis of performance of link items between year groups Analysis of historical links
3	ConQuest	IRT analysis Generation of plausible values unbiased estimates and better estimation of the confidence intervals associated with reported statistics	Final Item parameters Final student ability parameters
4	SPSS (ACER) Replicates WesVar	Replication procedures Compute estimates and replicate variance estimates by properly reflecting complex sampling and estimation procedures	Final student weightings Preparation for variance estimates Final Scaled score results Sample error estimates Group estimates by mean, Standard Error (SE) and effective sample size (EFF)
5	Error analysis	Group proficiency levels	Proficiency level by percent by group Confidence intervals by group

- Missing information on gender, where gender could be imputed from the school (i.e. where single-sex) or name of the student.

Coding of the student background survey

The student background survey collected demographic information for the students participating in the assessment. The demographic information was collected to allow for reporting of the achievement of groups of interest to policy makers and had been collected in a standardised form that conformed to guidelines produced by the PMRT⁴. These guidelines also determined the way in which these data were prepared for analysis and reporting purposes. A list of the questions comprising the background survey is provided in Appendix A.

Missing codes were:

- Not Administered (7)
- Multiple / invalid response (8, 88)
- Missing - Blank (9, 99)

Following data capture, the permanent home address of the Year 10 students was coded to the MCEETYA *Geographical Location Classification* using the *MCEETYA Geographical Location Index* (Jones, 2004) and the parental occupation data were coded (manually) to the four occupation

⁴ *Data implementation manual for enrolments for the 2007 school year.*

groups required by the *Data Implementation Manual*, creating a single variable for mother's occupation and a single variable for father's occupation.

Variables were also derived for the purposes of reporting achievement outcomes by specified groups. The transformations undertaken followed the guidelines in the *Data Implementation Manual*. Table 4.5 shows the derived variables and the transformation rules used to derive them. Due to large amounts of missing data, parental education was not included in the report.

Table 4.5 Transformation rules used to derive variables in the public report

Variable	Transformation rule
Geolocation - School	Derived from MCEETYA Geographical Location Classification: Used the Zones rather than the subcategories.
Geolocation – Student	Derived from MCEETYA Geographical Location Classification: Used the Zones rather than the subcategories.
Gender	Classified by response; missing data treated as missing unless the student was present at a single-sex school.
Age – Years	Year 6 = Age in years and months calculated from Date of Birth and Date of Testing. Year 10 = Recorded response.
Indigenous	Coded as Indigenous if response was 'yes' to Aboriginal, OR Torres Strait Islander OR Both.
Country of Birth	Classified as 'Australia' or 'Other' according to response.
Language Background other than English (LBOTE)	Coded as LBOTE if response was 'yes' to any of the Student, Mother or Father speaking a language other than English at home. If any of the data were missing then the data from the other questions were used. If all of the data were missing then LBOTE was coded as missing.
Parental Occupation	The MCEETYA Occupation groups were used to code the occupations of each parent. Parental Occupation was taken the highest status occupation group (of either parent). Where one parent had missing data or was classified as 'Not in paid work', the occupation group of the other parent was used. Those recorded as home duties or volunteer work, unemployed or retired were all classified as 'Not in paid work'. 'Deceased' was classified as 'Not applicable', and treated as 'Missing' Where one parent had missing data and the other was classified as 'Not in paid work', Parental Occupation equalled 'Not in paid work'. Only if parental occupation data for both parents were missing, would Parental occupation be coded as 'Missing'.

School reports

Following data entry and cleaning, reports of student performance were sent to each participating school. Samples of school reports are provided in Appendix D.

Summary

In the Australian national assessment of ICT Literacy in 2005 (MCEETYA, 2007) computer-based assessments were delivered by means of mini-labs of laptop computers transported to 520 schools over a 10-week period. For NAP-ICTL08 the preferred medium of delivery of the assessment was to use school-based computers and three options were provided: Internet access to a remote server; connection of a local server (a laptop computer) to a school network; provision of a mini-lab of computers. The most commonly used method was the connection of a

laptop to the school network as a local server being adopted in approximately 68 per cent of schools. Use of an internet connection to a remote server was adopted in 18 per cent of schools and the mini-lab method was adopted in approximately 14 per cent of the schools.

As the assessment was computer based many data management procedures were simplified compared to a pen and paper administered survey. The assessment surveys also benefited by having test administrators administer the assessments in schools. Nevertheless it was important to clean the data for any aberrant responses and to ensure that data were transformed into metrics that provided a basis for meaningful analysis.

CHAPTER 5

SCALING PROCEDURES

The scaling model

The one-parameter IRT model (the Rasch model) was used as the basis for the analysis of the student response data from NAP-ICTL08. The use of Rasch measurement models was consistent with the procedures used for other National Assessment Programs in Science and Civics and Citizenship and the processes are consistent with those used in other programs such as the OECD's Programme for International Student Assessment (PISA).

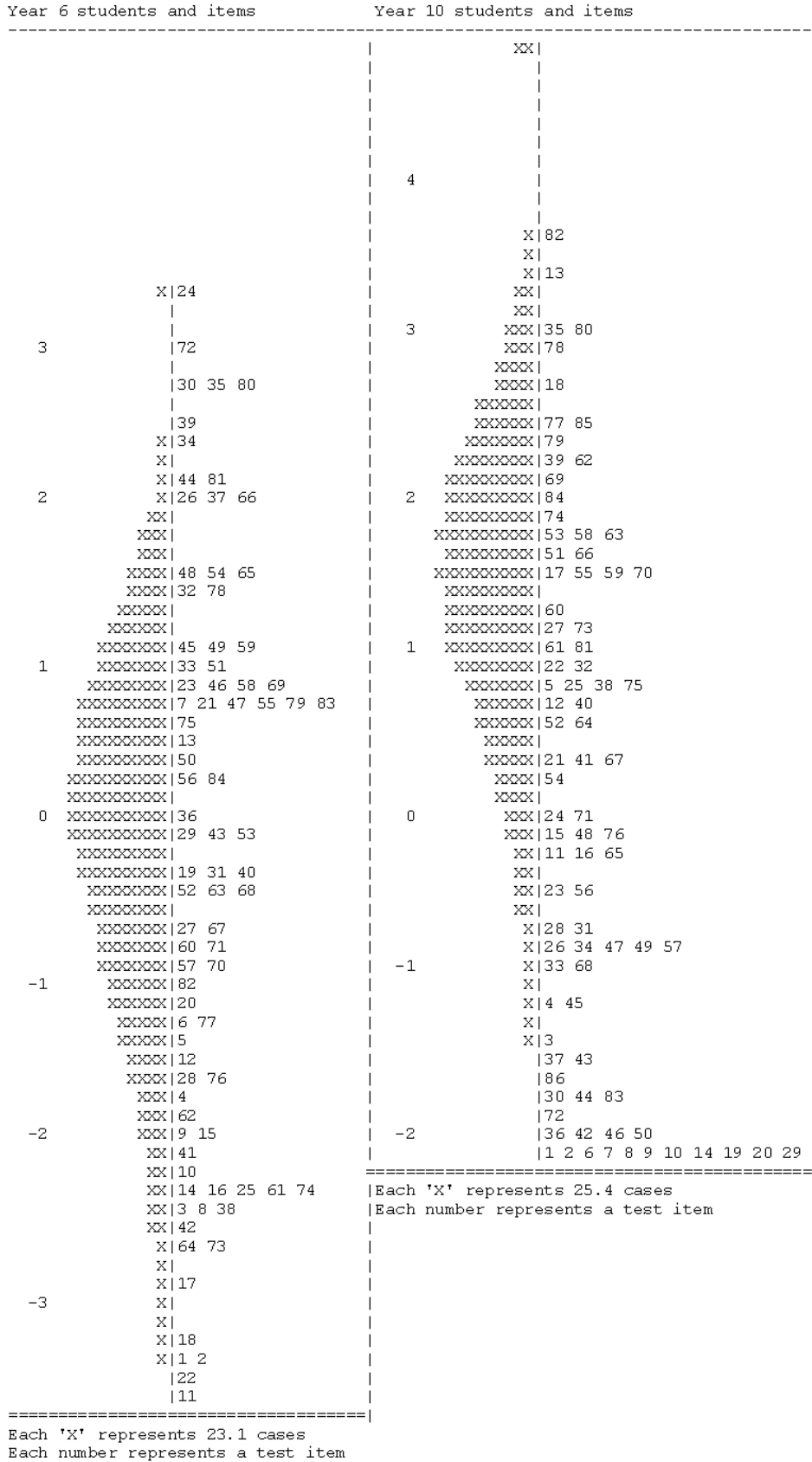
A consequence of using the Rasch model as a basis for the analysis is that the difficulty of all the tasks in the assessment and the performance of all students who participated in the study can be placed on the same scale. A further benefit is that the Rasch model can be used to equate scores from the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

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

Figure 5.1 displays the relative difficulty of the items and the performance of all the participants in the study on the logit scale by year level. The crosses represent students, and the distributions with numbers represent the items. In this figure, the average of all item difficulties was constrained to a value of zero logits.

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

Figure 5.1 Distributions of Student ICT Literacy and Task Difficulties in 2008



Item calibration

To derive the scale that is represented in Figure 5.1, two steps were undertaken in the scaling process. In the first step, the items were calibrated. Items that were not reached by a student were treated as not administered during the item calibration (all consecutive missing values clustered at the end of a test session, except for the first value of the missing series, which was treated as item level non-response).

A calibration sample was drawn for this step in the scaling process. Two hundred and twenty five students were sub-sampled from each state and territory, from each year level. The chance to be selected for the calibration sample was directly related to the number of students each student represented in the population. In other words, students with higher weights had more chance of being sub-sampled. This method resulted in a self-weighting calibration sample with equally weighted states and territories.

The two year levels were scaled together for the item calibration (also referred to as joint calibration), so that the items that were used to assess students at both year levels (the vertical link items) only receive one estimate of their difficulty. During scaling, the average difficulty of all items was fixed to zero logits. All other estimates are relative to this fixed point. Afterwards, the scale has been shifted to the ICT literacy scale that was established in 2005, which is described below under horizontal equating.

Joint calibration of the Year 6 and Year 10 items results in a single scale for both tests. Therefore, no additional vertical equating was required.

Table 5.1 shows the item difficulties in logits for the main study item pool. The first three letters of the item names denotes the unit the item belongs to. The next two digits are the item number within the unit. Items with _6 as extension were only administered in Year 6, items with _10 only in Year 10 and items with _L in both year levels (link items). Some of the link items were broken into two separate items, because the relative difficulty differed between year levels. In cases such as these, there are two items with the same item name, but a different extension (_6 and _X).

Table 5.1 Difficulty location in logits for main study item pool

Item name	Delta	Item name	Delta	Item name	Delta	Item name	Delta
DVD01_6	-3.374	ISU01_X	-0.694	GNS01_L	2.514	SPN01_6	-0.880
DVD01_X	-3.389	ISU03_X	-0.472	GNS02_6	-0.351	SPN02_6	1.760
DVD02_L	-2.438	ISU04_X	0.922	GNS02_X	-2.118	SPN02_X	1.510
DVD10_L	-1.729	ISU06_X	-0.915	GNS03_L	-2.501	SPN03_6	1.246
DVD11_6	-1.391	ISU07_X	-0.828	GNS04_6	-0.051	SPN03_X	1.092
DVD12_6	-1.252	ISU08_X	2.985	GNS05_L	2.104	SPN04_L	2.250
DVD12_X	0.796	ISU10_X	-2.651	GNS06_X	1.057	SPN05_6	1.723
DVD16_6	-2.438	ISU11_X	-2.291	GNS07_L	0.813	SPN05_X	0.559
DVD16_X	-1.976	ISU13_X	0.609	GNS08_L	0.785	SPN06_L	-0.217
DVD17_L	-2.171	PHA01_6	-1.558	GNS09_L	1.608	SPN07_L	1.585
DVD18_6	-3.871	PHA02_L	-1.209	GNS10_6	1.103	SPN09_L	0.350
DVD18_X	-1.516	PHA03_6	1.492	GNS12_6	0.375	SPN13_L	-1.016
DVD19b_	0.520	PHA03_X	0.774	GNS12_X	0.972	SPN15_6	2.097
DVD21_L	-2.266	PHA09_X	2.712	GNS13_L	-0.458	SPN15_X	1.551
DVD22_6	-1.995	PHA10_6	2.182	GNS15_6	-0.070	SPN16_L	-0.067
DVD22_X	-2.317	PHA10_X	-1.058	GNS15_X	1.562	SPN17_6	-1.910
DVD25_6	-2.890	PHA11_L	0.708	GNS16_6	0.807	SPN17_X	1.158
DVD25_X	-3.252	PHA12_6	0.325	GNS17_L	0.260	SSV01_L	1.853
DVD26_L	-0.252	PHA13_6	-2.504	GNS18_6	-0.866	SSV02_6	0.805
DVD29_6	-1.158	PHA14_6	-1.545	GNS18_X	0.904	SSV02_X	-0.184
DVD29_X	0.718	PHA14_X	-1.775	GNS19_L	1.111	SSV03_6	2.503
FPC01_X	-3.480	PHA17_6	-1.222	GNS20_L	-0.779	SSV03_X	2.904
FPC02_L	0.855	PHA17_X	-2.220	GNS21_6	-2.303	SSV04_L	2.362
FPC03_L	3.434	PHA18_6	-0.823	GNS22_L	-1.770	SSV06_6	3.065
FPC04_6	-2.283	PHA18_X	-0.095	GNS23_6	-0.466	SSV06_X	1.095
FPC05_L	2.063	PHA19_6	-0.886	GNS23_X	-2.618	SSV08_L	3.676
FPC06_6	-0.704	PHA19_X	-2.439	GNS24_L	1.584	SSV09_6	-1.836
FPC06_X	-1.543	PHA20_6	1.598	GNS25_6	1.999	SSV09_X	1.950
FPC07_X	-0.104	PHA20_X	0.527			SSV15_L	2.400
FPC08_L	2.690	PHA21_6	1.804			SSV16_L	-1.637
FPC09_6	-0.263	PHA21_X	0.192				
FPC09_X	1.510	PHA25_L	1.567				
FPC10_L	1.005	PHA26_L	-0.475				
FPC13_L	2.360						
FPC14_L	2.730						
FPC15_L	0.070						
FPC16_6	1.992						
FPC16_X	-2.378						

Plausible values

In the second step of the scaling process, student abilities were estimated. Here, the items not reached were treated as incorrect responses, similar to the treatment of embedded missing responses. Plausible value methodology was used to generate estimates of students' ICT literacy.

In any item response scaling model, student abilities are not directly observed but are inferred from observed item responses. One of the approaches to making this inference that recognises the uncertainty of the estimation is known as plausible value methodology. This methodology incorporates the uncertainty generated by measurement error and sampling error. Using item parameters anchored at their estimated values from calibration samples, plausible values are randomly drawn from the marginal posterior of the latent distribution for each student. This distribution reflects the most likely range of a student's true ability. Estimations are based on the conditional item response model and the population model, which includes the regression on background variables. ACER Conquest software was used for drawing plausible values.

To estimate a posterior distribution for each student, the raw score on the test is used as the main information. However, not every student with the same raw score has the same posterior distribution. All background information that was collected with the student questionnaire, in addition to school membership, was used in the model as regressors to improve the location and decrease the variance of the posterior distribution. When the most likely ability range was estimated for each student, five plausible values were randomly drawn from the distribution.

Background variables were recoded into regressors. The specific recodes are presented in Appendix E.

Assessment of item fit

Test items were evaluated and selected for the main study scale based on the quality and content of each item. The quality was based on satisfying item statistics like item fit and differential item functioning by sex.

The Rasch model assumes that each item in a test discriminates equally well between students at the top end and at the bottom end of the scale. In other words, the slopes of the item characteristic curves are assumed to be equal. Of course, this is not strictly possible when using real data. Item fit (weighted mean square) statistics were used to evaluate violation of this assumption. Most importantly, they were used to drop items from the test that did not discriminate between high and low performing students (i.e. items with flat slopes).

Table 5.2 shows the item fit statistics for each item that was selected for the main study. The average weighted mean square is 1. Items with a higher value discriminate less well between high and low performing students (flatter slopes), whilst items with lower values discriminate better (steeper slopes). T-values of more than 1.96 or less than -1.96 indicate that the slope is significantly different from the average slope.

Table 5.2 Item fit statistics – final items in main study

Item name	Weighted MNSQ	t-value	Item name	Weighted MNSQ	t-value
DVD01_6	1.07	2.2	ISU01_X	1.09	1.9
DVD01_X	1.03	0.6	ISU03_X	0.95	-1.6
DVD02_L	1.11	1.9	ISU04_X	0.93	-1.3
DVD10_L	1.04	0.6	ISU06_X	0.92	-1.7
DVD11_6	1.09	1.5	ISU07_X	0.81	-3.7
DVD12_6	1.01	0.3	ISU08_X	1.11	2.1
DVD12_X	0.98	-0.3	ISU10_X	0.92	-1.3
DVD16_6	0.93	-1.4	ISU11_X	0.92	-2.6
DVD16_X	0.95	-0.2	ISU13_X	1.14	2.3
DVD17_L	1.00	0.1	PHA01_6	1.11	1.9
DVD18_6	0.87	-1.6	PHA02_L	0.95	-0.8
DVD18_X	0.86	-5.2	PHA03_6	0.98	-0.3
DVD19b_	1.08	1.7	PHA03_X	1.00	0
DVD21_L	0.87	-5.3	PHA09_X	1.06	1.1
DVD22_6	0.86	-4.3	PHA10_6	1.04	1.2
DVD22_X	0.87	-3.5	PHA10_X	0.95	-0.7
DVD25_6	0.91	-1.3	PHA11_L	0.99	-0.2
DVD25_X	0.87	-4.7	PHA12_6	0.87	-1.8
DVD26_L	0.95	-1.3	PHA13_6	1.07	2.4
DVD29_6	1.13	2.5	PHA14_6	1.00	0
DVD29_X	1.25	5.1	PHA14_X	1.07	2.7
FPC01_X	1.13	3.2	PHA17_6	0.99	-0.3
FPC02_L	0.99	-0.2	PHA17_X	1.02	0.5
FPC03_L	1.18	6.9	PHA18_6	1.04	0.9
FPC04_6	1.16	3.8	PHA18_X	1.06	1.3
FPC05_L	1.00	-0.1	PHA19_6	0.88	-2.9
FPC06_6	0.94	-2.5	PHA19_X	0.87	-3.5
FPC06_X	0.97	-0.6	PHA20_6	1.08	1.7
FPC07_X	1.12	4.1	PHA20_X	1.07	1.7
FPC08_L	0.97	-1	PHA21_6	1.09	1.9
FPC09_6	0.92	-2.7	PHA21_X	1.07	1.8
FPC09_X	0.99	-0.3	PHA25_L	1.08	3.1
FPC10_L	1.06	2.5	PHA26_L	1.10	4.5
FPC13_L	0.91	-3	SPN01_6	0.95	-0.8
FPC14_L	0.98	-0.3	SPN02_6	1.00	-0.1
FPC15_L	0.98	-0.5	SPN02_X	1.05	1.5
FPC16_6	0.93	-2.3	SPN03_6	0.99	-0.1
FPC16_X	0.95	-0.6	SPN03_X	0.98	-0.8
GNS01_L	1.11	1.4	SPN04_L	0.95	-1.9
GNS02_6	1.03	0.4	SPN05_6	1.06	2.2
GNS02_X	1.06	0.5	SPN05_X	1.09	1.8

Item name	Weighted MNSQ	t-value	Item name	Weighted MNSQ	t-value
GNS03_L	0.99	-0.2	SPN06_L	1.10	4.3
GNS04_6	1.10	2.6	SPN07_L	0.95	-1.3
GNS05_L	0.99	-0.2	SPN09_L	0.96	-1.1
GNS06_X	1.13	1.9	SPN13_L	1.04	1
GNS07_L	0.99	-0.4	SPN15_6	1.02	0.3
GNS08_L	0.98	-1.2	SPN15_X	1.02	0.2
GNS09_L	1.03	0.6	SPN16_L	1.02	0.3
GNS10_6	1.01	0.1	SPN17_6	1.12	2.9
GNS12_6	1.00	-0.1	SPN17_X	1.11	2.5
GNS12_X	1.04	0.5	SSV01_L	0.91	-2.4
GNS13_L	1.05	0.5	SSV02_6	0.86	-3.9
GNS15_6	1.01	0.4	SSV02_X	0.90	-0.9
GNS15_X	1.06	1	SSV03_6	1.06	1.5
GNS16_6	1.09	3.9	SSV03_X	1.12	4
GNS17_L	0.90	-2.4	SSV04_L	0.96	-1.3
GNS18_6	0.95	-1.1	SSV06_6	0.98	-0.3
GNS18_X	0.95	-0.5	SSV06_X	0.98	-0.5
GNS19_L	0.91	-2	SSV08_L	0.97	-0.9
GNS20_L	0.92	-1.3	SSV09_6	0.88	-3.5
GNS21_6	0.92	-1	SSV09_X	0.93	-0.6
GNS22_L	1.03	1.5	SSV15_L	0.92	-2.8
GNS23_6	1.04	1.4	SSV16_L	0.94	-2.7
GNS23_X	1.07	1.4			
GNS24_L	0.97	-1.7			
GNS25_6	1.13	1.3			

Differential item functioning by sex

Another item characteristic that has been evaluated for the selection of items for the main study scale is differential item functioning (DIF) by sex. Ideally, every student with the same ability has an equal chance to respond correctly to an item in a test. For example, a male student and a female student have the same chance to respond correctly to an item if they have the same ability that is measured by the test. However, in reality some items favour male students and other items favour female students more.

Table 5.3 shows DIF indices for each item by year level. The DIF index is the difference between the general item difficulty and the difficulty for boys. Items with a negative DIF favour male students and items with a positive DIF favour female students. Values below -0.15 and above 0.15 are in bold. In addition, values that differ significantly from zero are indicated in the column $p < .05$.

Table 5.3 Differential item functioning by sex and year level

Year 6				Year 10			
Item	DIF	SE	p<0.05	Item	DIF	SE	p<0.05
DVD01_6	-0.17	0.08	Sign.	DVD01_X	-0.31	0.09	Sign.
DVD02_L	-0.12	0.14		DVD02_L	0.00	0.10	
DVD10_L	0.28	0.11	Sign.	DVD10_L	0.21	0.17	
DVD11_6	0.18	0.10		DVD12_X	0.27	0.12	Sign.
DVD12_6	0.09	0.08		DVD16_X	0.27	0.21	
DVD16_6	0.42	0.09	Sign.	DVD17_L	0.01	0.09	
DVD17_L	0.23	0.08	Sign.	DVD18_X	0.13	0.08	
DVD18_6	-0.05	0.13		DVD19b_L	0.09	0.07	
DVD19b_L	0.10	0.06		DVD21_L	-0.02	0.08	
DVD21_L	-0.06	0.09		DVD22_X	0.04	0.08	
DVD22_6	0.17	0.08	Sign.	DVD25_X	0.03	0.08	
DVD25_6	-0.03	0.12		DVD26_L	0.27	0.08	Sign.
DVD26_L	0.29	0.14	Sign.	DVD29_X	0.08	0.06	
DVD29_6	-0.14	0.07	Sign.	FPC01_X	-0.23	0.08	Sign.
FPC02_L	-0.33	0.07	Sign.	FPC02_L	-0.24	0.09	Sign.
FPC03_L	-0.46	0.07	Sign.	FPC03_L	-0.33	0.08	Sign.
FPC04_6	-0.01	0.06		FPC05_L	-0.28	0.08	Sign.
FPC05_L	-0.22	0.07	Sign.	FPC06_X	-0.16	0.09	
FPC06_6	-0.06	0.07		FPC07_X	-0.43	0.07	Sign.
FPC08_L	-0.22	0.07	Sign.	FPC08_L	-0.11	0.12	
FPC09_6	-0.20	0.07	Sign.	FPC09_X	-0.19	0.08	Sign.
FPC10_L	-0.13	0.07		FPC10_L	-0.10	0.08	
FPC13_L	-0.11	0.07		FPC13_L	-0.20	0.11	
FPC14_L	0.04	0.09		FPC14_L	0.16	0.18	
FPC15_L	0.03	0.08		FPC15_L	0.27	0.15	
FPC16_6	-0.05	0.07		FPC16_X	0.10	0.12	
GNS01_L	-0.13	0.11		GNS01_L	-0.35	0.17	Sign.
GNS02_6	0.19	0.11		GNS02_X	-0.13	0.14	
GNS03_L	-0.10	0.08		GNS03_L	-0.10	0.12	
GNS04_6	0.15	0.07	Sign.	GNS05_L	0.13	0.09	
GNS05_L	0.00	0.06		GNS06_X	-0.11	0.09	
GNS07_L	-0.12	0.06	Sign.	GNS07_L	-0.07	0.09	
GNS08_L	-0.12	0.06	Sign.	GNS08_L	-0.20	0.06	Sign.
GNS09_L	-0.01	0.08		GNS09_L	-0.13	0.12	
GNS10_6	-0.02	0.07		GNS12_X	-0.09	0.10	
GNS12_6	-0.20	0.08	Sign.	GNS13_L	-0.07	0.26	
GNS13_L	0.04	0.15		GNS15_X	-0.04	0.08	
GNS15_6	-0.07	0.07		GNS17_L	0.09	0.14	
GNS16_6	0.19	0.06	Sign.	GNS18_X	0.05	0.12	
GNS17_L	0.04	0.07		GNS19_L	-0.04	0.14	
GNS18_6	-0.11	0.07		GNS20_L	-0.04	0.16	
GNS19_L	-0.02	0.08		GNS22_L	-0.15	0.06	Sign.
GNS20_L	0.05	0.09		GNS23_X	-0.03	0.08	
GNS21_6	0.04	0.11		GNS24_L	-0.15	0.06	Sign.

Year 6				Year 10			
Item	DIF	SE	p<0.05	Item	DIF	SE	p<0.05
GNS22_L	-0.06	0.05		ISU01_X	0.06	0.05	
GNS23_6	-0.08	0.06		ISU03_X	0.00	0.08	
GNS24_L	-0.12	0.06	Sign.	ISU04_X	-0.03	0.10	
GNS25_6	0.03	0.13		ISU06_X	0.05	0.05	
PHA01_6	-0.14	0.10		ISU07_X	0.05	0.06	
PHA02_L	0.09	0.11		ISU08_X	0.05	0.04	
PHA03_6	-0.45	0.11	Sign.	ISU10_X	-0.02	0.06	
PHA10_6	-0.33	0.08	Sign.	ISU11_X	-0.14	0.08	
PHA11_L	-0.09	0.10		ISU13_X	-0.17	0.06	Sign.
PHA12_6	0.11	0.11		PHA02_L	0.00	0.22	
PHA13_6	-0.28	0.08	Sign.	PHA03_X	-0.42	0.07	Sign.
PHA14_6	-0.13	0.11		PHA09_X	-0.55	0.10	Sign.
PHA17_6	0.03	0.05		PHA10_X	-0.33	0.12	Sign.
PHA18_6	0.12	0.05	Sign.	PHA11_L	-0.07	0.16	
PHA19_6	0.19	0.06	Sign.	PHA14_X	0.09	0.07	
PHA20_6	0.09	0.05		PHA17_X	0.23	0.04	Sign.
PHA21_6	0.07	0.06		PHA18_X	0.25	0.04	Sign.
PHA25_L	-0.06	0.08		PHA19_X	0.28	0.05	Sign.
PHA26_L	0.02	0.08		PHA20_X	0.24	0.04	Sign.
SPN01_6	0.17	0.10		PHA21_X	0.20	0.05	Sign.
SPN02_6	0.12	0.08		PHA25_L	0.02	0.08	
SPN03_6	0.09	0.08		PHA26_L	0.14	0.07	
SPN04_L	-0.11	0.07		SPN02_X	-0.07	0.08	
SPN05_6	-0.36	0.07	Sign.	SPN03_X	0.18	0.07	Sign.
SPN06_L	0.09	0.08		SPN04_L	0.07	0.11	
SPN07_L	0.31	0.08	Sign.	SPN05_X	-0.38	0.09	Sign.
SPN09_L	0.18	0.08	Sign.	SPN06_L	0.07	0.08	
SPN13_L	0.18	0.11		SPN07_L	0.16	0.12	
SPN15_6	0.17	0.14		SPN09_L	0.18	0.13	
SPN16_L	0.06	0.11		SPN13_L	0.09	0.10	
SPN17_6	0.24	0.06	Sign.	SPN15_X	0.20	0.17	
SSV01_L	0.20	0.08	Sign.	SPN16_L	0.00	0.17	
SSV02_6	0.10	0.07		SPN17_X	0.19	0.06	Sign.
SSV03_6	-0.11	0.08		SSV01_L	0.01	0.15	
SSV04_L	-0.02	0.04		SSV02_X	0.05	0.15	
SSV06_6	-0.02	0.07		SSV03_X	-0.13	0.08	
SSV08_L	0.22	0.09	Sign.	SSV04_L	-0.03	0.05	
SSV09_6	0.00	0.07		SSV06_X	-0.12	0.06	Sign.
SSV15_L	0.04	0.05		SSV08_L	0.16	0.08	Sign.
SSV16_L	-0.01	0.07		SSV09_X	0.11	0.14	
				SSV15_L	0.09	0.05	
				SSV16_L	-0.06	0.08	

Item deletions

Of the remaining 116 items in the main study test, 107 were administered in Year 6 and all 116 were administered in Year 10. Of the 107 items that were administered in both levels, 41 were kept as vertical link items. Eighty-four Year 6 items were selected for the main study scale, and 86 Year 10 items. Table 5.4 lists the items that were deleted from either or both year levels and link items that were kept for both year levels, but treated as two different items (*Broken*).

Table 5.4 Items deleted from scaling

<i>Item</i>	<i>Deleted</i>	<i>Item</i>	<i>Deleted</i>
DVD01	Broken	PHA01	Year 10
DVD04	Both	PHA03	Broken
DVD05	Both	PHA10	Broken
DVD11	Year 10	PHA12	Year 10
DVD12	Broken	PHA13	Year 10
DVD16	Broken	PHA14	Broken
DVD18	Broken	PHA17	Broken
DVD19	Both	PHA18	Broken
DVD20	Both	PHA19	Broken
DVD22	Broken	PHA20	Broken
DVD25	Broken	PHA21	Broken
DVD29	Broken	PHA27	Both
FPC01	Year 6	PHA28	Both
FPC04	Year 10	SPN01	Year 10
FPC06	Broken	SPN02	Broken
FPC07	Year 6	SPN03	Broken
FPC09	Broken	SPN05	Broken
FPC11	Both	SPN08	Both
FPC12	Both	SPN10	Both
FPC16	Broken	SPN12	Both
FPC17	Both	SPN14	Both
GNS02	Broken	SPN15	Broken
GNS04	Year 10	SPN17	Broken
GNS06	Year 6	SSV02	Broken
GNS10	Year 10	SSV03	Broken
GNS11	Both	SSV06	Broken
GNS12	Broken	SSV07	Both
GNS14	Both	SSV09	Broken
GNS15	Broken	SSV10	Both
GNS16	Year 10	SSV17	Both
GNS18	Broken	SSV18	Both
GNS21	Year 10	SSV19	Both
GNS23	Broken		
GNS25	Year 10		

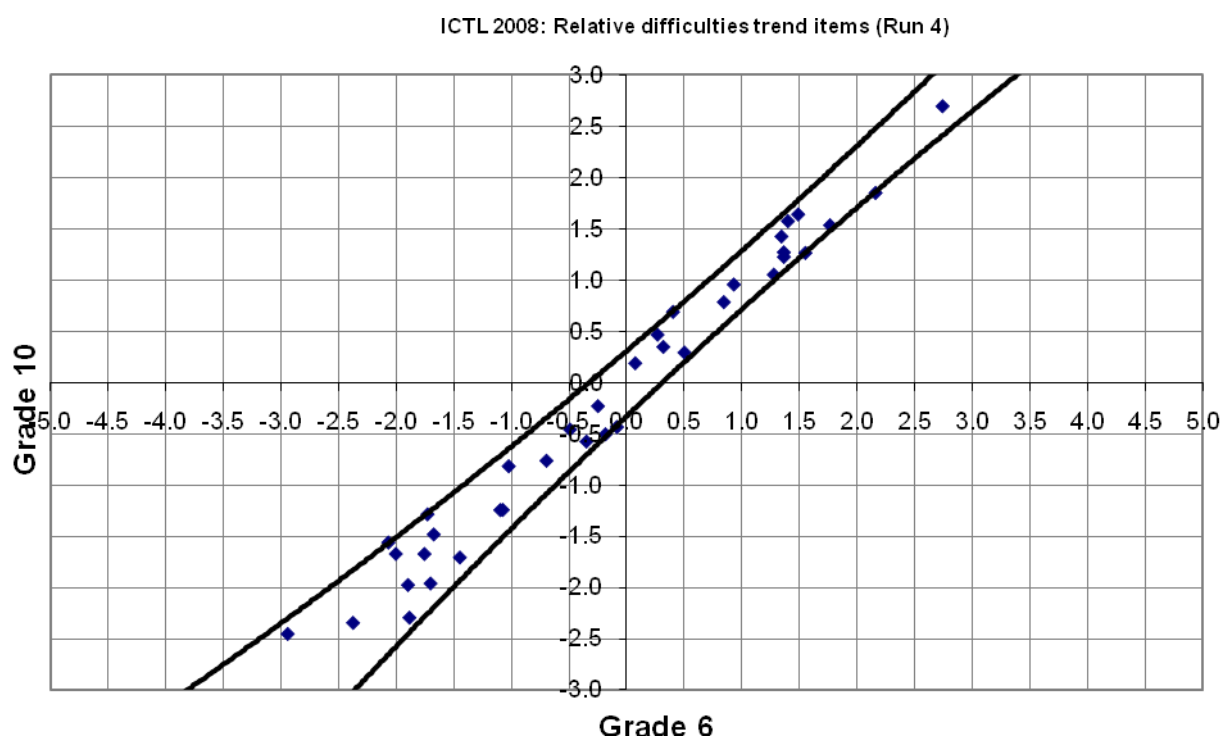
Vertical and horizontal equating

Equating Year 6 and Year 10 in 2008

An analysis of the manner in which the common items measured ICT Literacy at Year 6 compared to Year 10 was undertaken and only those items that functioned similarly at both year levels were used to establish the relative performance of Year 6 and Year 10 students. Items which functioned differently at the two year levels did not inform the calibration of the comparisons as they could be manifestations of attributes different from, or in addition to, ICT literacy. In the final analysis, 41 items were used to link the Year 6 and Year 10 student responses.

Figure 5.2 shows the scatter plot of the relative item difficulties of the 41 accepted link items.

Figure 5.2 Scatter plot of relative item difficulties in year 6 and year 10



Equating NAP-ICTL05 and NAP-ICTL08

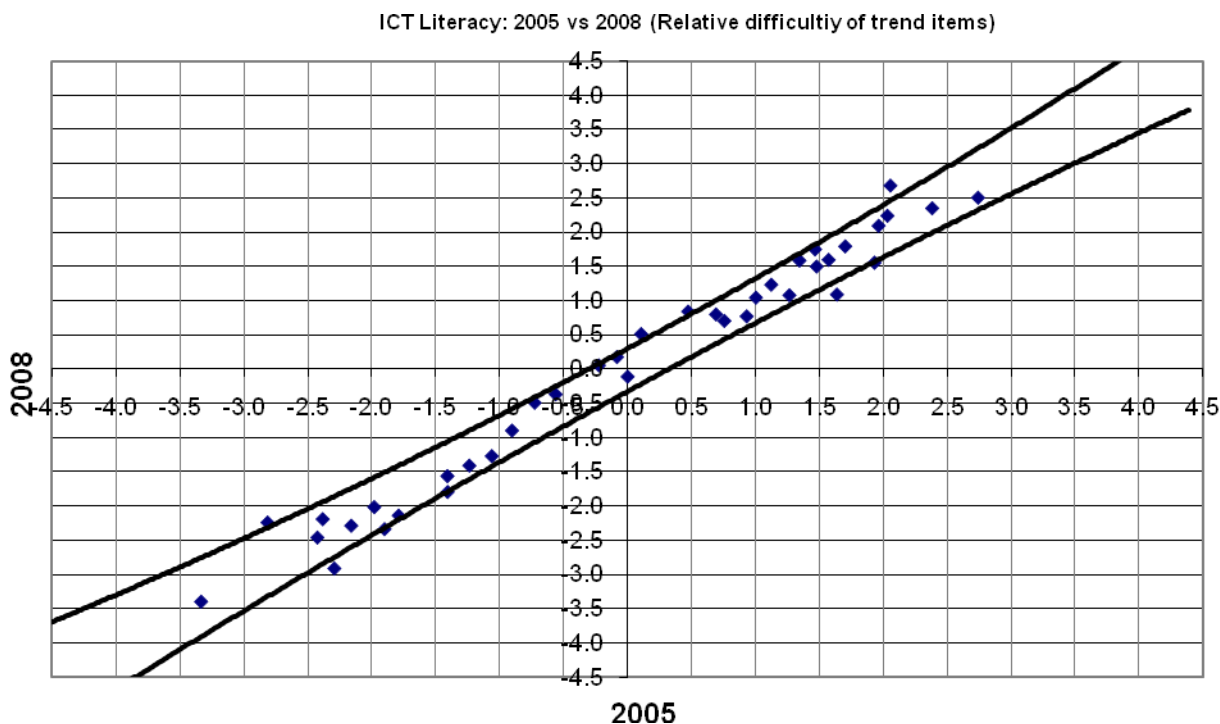
A major outcome of NAP-ICTL05 was the establishment of a scale of ICT literacy. In NAP-ICTL08, three assessment modules from NAP-ICTL05 were included along with four new modules. Rasch analysis enabled the new items to be placed on the established ICT literacy scale. Consequently, this also enabled the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

The same methodology used to assess the consistency of the manner in which items functioned in Year 6 and Year 10 was applied to the items from the modules common to 2005 and 2008 in order to determine which items were suitable for use as calibration links between 2005 and 2008. That is, relative difficulty of link items were compared across cycles, as were average DIF by gender and average item fit (slope of item characteristic curves). Of the 60 items available to be included, the analysis resolved that 39 items had performed sufficiently uniformly to be included

in the final determination of the results of the 2008 study compared to the ICT literacy scale established in 2005.

Figure 5.3 shows the comparison of the 39 trend items in relative difficulty and their confidence intervals.

Figure 5.3 Scatter plot of relative item difficulties in NAP-ICTL 2005 and 2008.



Uncertainty in the link

The transformation that equates the 2008 data with the 2005 data depends upon the change in difficulty of each of the individual link items, and as a consequence the sample of link items that have been chosen will influence the choice of transformation. This means that the resulting transformation would be slightly different if an alternative set of link items had been chosen. The consequence is an uncertainty in the transformation due to the sampling of the link items, just as there is an uncertainty in values such as state or territory means due to the use of a sample of students.

The uncertainty that results from the link-item sampling is referred to as linking error and this error must be taken into account when making comparisons between the results from different data collections. Just as with the error that is introduced through the process of sampling students, the exact magnitude of this linking error cannot be determined. We can, however, estimate the likely range of magnitudes for this error and take this error into account when interpreting results. As with sampling errors, the likely range of magnitude for the errors is represented as a standard error.

Table 5.5 Items by scale with item-total correlations

Item	Item wording	Year 6	Year 10
	Application: Social Communication (SOCCOM)		
R04a	How often do you search the Internet for information for study or school work?	0.48	0.52
R04c	How often do you use word processing software to write documents?	0.53	0.56
R04d	How often do you use spreadsheets?	0.49	0.54
R04e	How often do you use mathematics, language or other learning programs on a computer?	0.44	0.44
	Application: School utilities (SCHUTIL)		
R05a	How often do you download games and/or other software applications from the Internet?	0.65	0.69
R05b	How often do you download or stream music and/or podcasts from the Internet?	0.64	0.56
R05c	How often do you play games on a computer?	0.52	0.58
R05d	How often do you use software to create sounds/music, movies or animations?	0.58	0.53
R05e	How often do you use a computer to listen to music or watch DVDs?	0.57	0.46
R06e	How often do you play multiplayer games over the Internet?	0.55	0.58
	Application: Entertainment use (ENTUSE)		
R04b	How often do you search the Internet for information that is not for study or school work?	0.41	0.45
R06a	How often do you use a computer for email or "chatting"?	0.64	0.62
R06b	How often do you write or reply to blogs or forum threads?	0.66	0.60
R06c	How often do you upload text, images or video to an online profile?	0.70	0.69
R06d	How often do you use voice chat (VOIP) to communicate with friends online?	0.59	0.42
R07d	How often do you store digital photos on a computer?	0.53	0.52
	Application: Computer technology (COMTECH)		
R07a	How often do you write computer programs or macros?	0.61	0.57
R07b	How often do you upload media you have created to the Internet for others to enjoy?	0.65	0.63
R07c	How often do you construct websites?	0.62	0.60
R07e	How often do you use drawing, painting or graphics programs on a computer?	0.40	0.45
	Interest in computers (INTCOM)		
R08a	It is very important to me to work with a computer.	0.49	0.53
R08b	I think playing or working with a computer is really fun.	0.50	0.58
R08c	I use a computer because I am very interested in technology.	0.43	0.47
R08d	I lose track of time when I am working with the computer.	0.45	0.50
R08e	When I am using a computer nothing else matters.	0.40	0.43
R08f	I need a computer to help me do my work.	0.31	0.36
R08g	Time goes quickly when I am using a computer.	0.52	0.56

The linking error was computed by using the following formula:

$$\sigma_{(Linking_error)} = \sqrt{\frac{\sigma^2}{n}}$$

where σ^2 represents the variance of the item parameter differences between 2005 and 2008, and n denotes the number of link items used. The linking error for trend reporting from 2005 to 2008 is 4.3 score points in the final reporting metric (0.045 logits).

Scaling of questionnaire items

Five scales reflecting ICT familiarity were derived from the student questionnaire. Four scales on modes of ICT application for different purposes were derived from five different item batteries reflecting frequencies of computer use (“at least once a day”, “almost every day”, “a few times each week”, “between once a week and once a month”, and “less than once a month”). Students’ interest in computers was derived from an additional item set with seven items reflecting students’ agreement (“strongly agree”, “agree”, “disagree”, and “strongly disagree”) with statements about computer use.

As a first step, exploratory factor analyses were undertaken to review item dimensionality. Five factors were identified and the five-factor structure was confirmed using confirmatory factor analysis using Mplus 4.1 (Muthén & Muthén, 1998-2007). The analyses showed a satisfactory model fit with an RMSEA of 0.058 for Year 6 and of 0.07 for Year 10 (RMSEA below 0.08 are generally seen as “satisfactory”, below 0.05 as “close”).

Table 5.5 shows the item mapping to scales and the (corrected) item-by-total correlations that show to what extent each item is related to the derived scale scores. Table 5.6 shows the internal consistency of scales which range between 0.7 and 0.8 in both year levels. Cronbach’s alpha values above 0.7 are generally seen as indicating satisfactory scale reliabilities.

Table 5.6 Scale reliabilities (Cronbach’s alpha)

Scale name	Year 6	Year 10
Application: Social Communication (SOCCOM)	0.82	0.79
Application: School utilities (SCHUTIL)	0.70	0.72
Application: Entertainment use (ENTUSE)	0.82	0.81
Application: Computer technology (COMTECH)	0.76	0.76
Interest in computers (INTCOM)	0.72	0.77

Once the scaling analysis had confirmed the expected factor structure, scale scores were derived using the IRT (Rasch) Partial Credit Model. Following an item parameter calibration with the software package ACER ConQuest (Wu, Adams, Wilson and Haldane, 2007) so-called weighted (maximum) likelihood estimates were computed by minimising the equation:

$$\sum_{i \in \Omega} \left[\left(r_x + \frac{J_n}{2I_n} \right) - \frac{\sum_{j=1}^k \frac{\exp(\sum_{j=0}^x \theta_n - \delta_i + \tau_{ij})}{\sum_{h=0}^{m_i} \exp(\sum_{k=0}^k (\theta_n - \delta_i + \tau_{ij}))}}{\sum_{h=0}^{m_i} \exp(\sum_{k=0}^k (\theta_n - \delta_i + \tau_{ij}))} \right] = 0 \quad (1)$$

for each case n , where r_x is the sum score obtained from a set of k items with j categories. This can be achieved by applying the Newton-Raphson method. The term $J_n/2I_n$ (with I_n being the information function for student n and J_n being its derivative with respect to θ) is used as a weight function to account for the bias inherent to maximum likelihood estimation (see Warm, 1989). These IRT scores were derived using an SPSS macro with pre-calibrated item parameters.

Scale scores were then transformed to their national metric with a mean of 0 and a standard deviation of 1 for the (weighted) Year 6 sample. The transformation is computed by applying the formula:

$$\theta'_n = \frac{\theta_n - \bar{\theta}}{\sigma_\theta},$$

where θ'_n are the student scores in the final metric, θ_n the original logit scores, $\bar{\theta}$ the mean of student logit scores in the weighted Year 6 sample, and σ_θ its corresponding standard deviation.

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 one-parameter Item Response Model (the Rasch model) was used to analyse item performance and develop the ICT Literacy scale. From the many tasks that were completed by both Year 6 and Year 10 students a set of common link items was selected to calibrate the scale across both Year 6 and Year 10. Plausible values were used to impute student scores on the ICT Literacy scale.

The 2008 assessment of ICT Literacy contained seven modules of which each student completed four. Six of the modules were for students from either Year 6 or Year 10 and one was only available to Year 10 students. Across the modules there were 107 tasks common to both Year levels and potentially available for comparing the relative performance of the Year 6 and Year 10 students (although only 37 of the 41 tasks were used in practice). Three assessment modules from NAP-ICTL05 were included in the 2008 assessment along with four new modules. Rasch analysis enabled the new items to be placed on the established ICT literacy scale. Consequently this enabled the results from NAP-ICTL08 to be compared directly with those from NAP-ICTL05. In practice 39 items had performed sufficiently uniformly across both cycles to be used to link the results of the 2008 study to the ICT literacy scale established in 2005.

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).

CHAPTER 6

PROFICIENCY LEVELS AND THE PROFICIENT STANDARDS

Proficiency levels

Creating the proficiency levels

In creating the proficiency levels, a similar approach as for the OECD PISA study has been adopted. For PISA, a method was developed that ensured that the notion of ‘being at a level’ could be interpreted consistently and in line with the fact that the achievement scale is a continuum. This method ensured that there was some common understanding about what ‘being at a level’ meant and that the meaning of ‘being at a level’ was consistent across levels. Similar to the approach taken in the OECD PISA study (OECD, 2005, p.255), this method takes the following three variables into account:

- the expected success of a student at a particular level on a test containing items at that level;
- the width of the levels in that scale; and
- the probability that a student in the middle of a level would correctly answer an item of average difficulty for that level.

Proficiency level cut-points

Although scale scores provide one succinct way of reporting ICT literacy overall and for comparisons of different groups of students, it is also possible to provide a profile of students’ ICT literacy in terms of proficiency levels. Six Proficiency Levels were defined in NAP-ICTL05 and descriptions were developed to characterise typical student performance at each level. To form the proficiency levels, the continuum of increasing ICT literacy was divided into six levels of equal width (i.e. an equal range of student ability/item difficulty on the scale) with the bottom and top levels being unbounded at each extreme. Cut scores for each proficiency level were defined in 2005 and those same cut-scores were applied to the 2008 data. In the report of the 2005 survey, the cut scores were determined on the logit scale and shown in terms of the reporting scale but an error was made in recording the transformed scores. The scale point cut scores shown in the 2005 report should have been the same as those shown in this report. The cut scores for the proficiency levels are shown in Table 6.1.

Table 6.1 Cut Scores for Proficiency Levels

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

Describing proficiency levels

Information about the items in each level was used to develop summary descriptions of the ICT literacy associated with different levels of proficiency. These summary descriptions encapsulate the ICT literacy of students associated with each level. As a set, the descriptions represent growth in ICT literacy. The levels are not discrete discontinuous steps but are a method of representing progress. The texts of the proficiency level descriptions shown in Table 6.2 are unchanged from the 2005 cycle. However, the newly developed assessment modules for NAP-ICTL08 have enabled some new examples of ICT literacy achievement to be added. Appendix F contains examples of tasks corresponding to each level.

Table 6.2 ICT Literacy Proficiency Level Descriptions

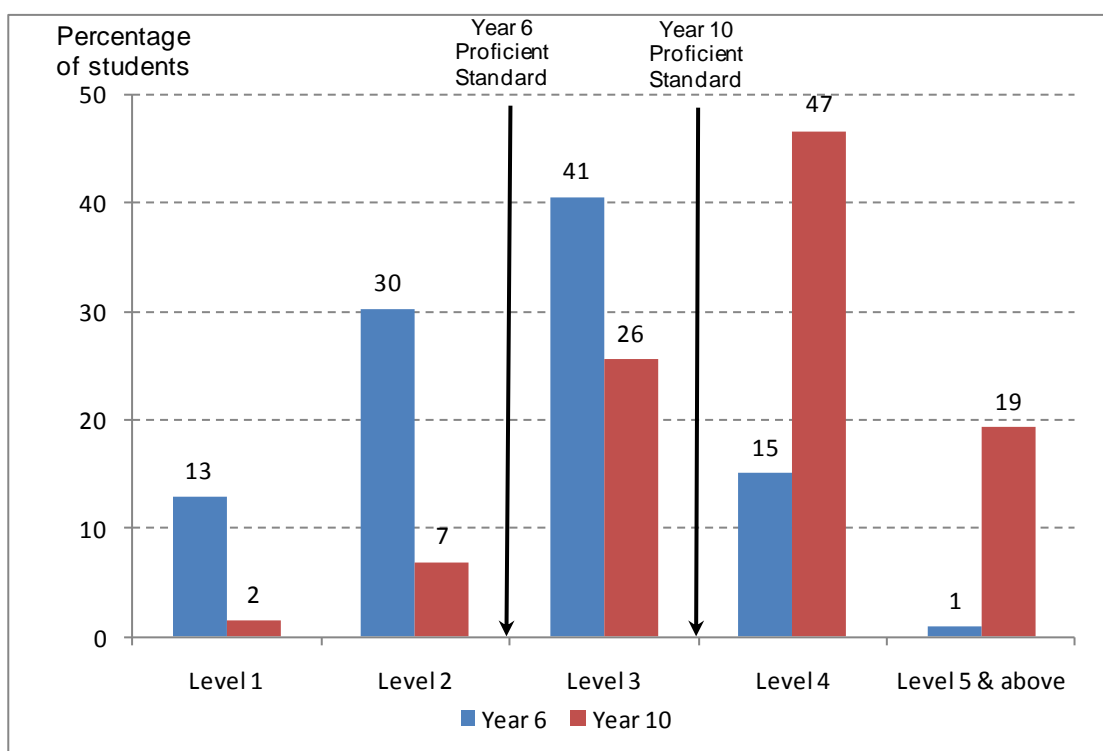
<i>Level</i>	<i>Proficiency level description</i>	<i>% Yr 6</i>	<i>% Yr 10</i>
6	Students working at level 6 create information products that show evidence of technical proficiency, and careful planning and review. They use software features to organise information and to synthesise and represent data as integrated complete information products. They design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work.	0.0	1.1
5	Students working at level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products.	1.0	18.2
4	Students working at level 4 generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this.	15.1	46.7
Proficient Standard Year 10			
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.	40.6	25.6
Proficient Standard Year 6			
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.	30.3	6.9
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	13.0	1.5

Distribution of students across proficiency levels

Table 6.2 describes the typical skills, attributes and knowledge that are manifestations of students performing within each proficiency level. The table also shows the percentage of students at each year level whose performance has resulted in their assignment to a particular level. Table 6.2 and Figure 6.1 show the distribution of ICT Literacy across the six proficiency levels described.

Proficiency level percentages in Table 6.2 (and those illustrated in Figure 6.1) show that overall Year 10 students are operating approximately one proficiency level higher than Year 6 students across the scale. Table 6.2 also shows that a higher proportion of Year 6 students are at the lower end of the Year 6 distribution than the corresponding proportion for Year 10. Approximately 43 per cent of Year 6 students are working at proficiency levels 1 and 2 whereas approximately 34 per cent of Year 10 students are working at proficiency levels 1, 2 and 3 (with only two per cent of Year 10 students at level 1).

Figure 6.1 Distributions of ICT Literacy across Proficiency Levels in 2008



Setting the standards

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

included currently practising teachers with specific ICT expertise, ICT curriculum experts and educational assessment experts. The process of establishing the proficiency cut-points for each of Years 6 and 10 was described in the report of NAP-ICTL05 (MCEETYA, 2007).

The proficient standard for Year 6 was established as the boundary between levels 2 and 3 equal to a score of 410 on the ICT literacy scale. From Table 6.3 it can be seen that in 2008, 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard. The proficient standard for Year 10 was established as the boundary between levels 3 and 4 equal to a score of 529 on the ICT literacy scale and in 2008 66 per cent of Year 10 students reached or exceeded the Year 10 proficient standard.

Table 6.3 Percentages of Year 6 and Year 10 Students attaining the Proficient Standard in ICT Literacy in 2008 and 2005

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

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

Summary

As part of the NAP-ICTL 2005 the ICT literacy scale was divided into six described proficiency levels in order to facilitate reporting. These levels indicated the ICT literacy of a student whose score fell in the range specified for that level. It was then possible to develop a profile of ICT literacy that indicated the percentages of students at each level. The same proficiency levels were used in NAP-ICTL 2008 so that the percentage distributions of students in the two cycles could be compared.

In addition, as part of NAP-ICTL2005, proficient standards were established for Year 6 and Year 10 to represent points on the ICT Literacy scale that represent a 'challenging but reasonable' expectation for Year 6 and 10 students to have reached. It was therefore possible to report the percentages of students at each year level who had attained the proficient standard expected for that year level. In addition because the proficient standard remained the same in 2008 as it had been in 2005 it was possible to compare the percentages that had attained the proficient standard.

CHAPTER 7 REPORTING OF RESULTS

Estimation of sampling and measurement variance

Student samples were obtained through two-stage cluster sampling procedures. At the first stage, schools were sampled from a sampling frame with a probability proportional to their size. At the second stage, 20 students were randomly sampled within schools (see Chapter 3 on Sampling and Weighting). Cluster sampling techniques permit an efficient and economic data collection. However, these samples are not simple random samples and the usual formulae to obtain standard errors for population estimates are not appropriate.

Replication techniques provide tools to estimate the correct sampling variance on population estimates (Wolter, 1985; Gonzalez and Foy, 2000). For the NAPICTLO8, the jackknife repeated replication technique (JRR) was used to compute standard errors for population means, percentages and regression coefficients.

Generally, the JRR method for stratified samples requires the pairing of Primary Sampling Units (PSUs) - here: schools - into pseudo-strata. The assignment of schools to 'sampling zones' needs to be consistent with the sampling frame from which they were sampled. Sampling zones were constructed within explicit strata. In the case of an odd number of schools within an explicit stratum or the sampling frame, the remaining school was randomly divided into two halves and added to the schools in the final sampling zone to form pseudo-schools. One hundred and forty five sampling zones were used for Year 6 and 137 were used for Year 10 in 2008.

Within each of these strata, one school was randomly assigned a value of 2, whereas the other school received a value of 0. For each of the sampling zones so-called replicate weights were computed so that one of the paired schools had a contribution of zero and the other a double contribution whereas all other schools remained the same. This is achieved by simply multiplying student weights with the jackknife indicators once for each sampling zone. As a result, for each so-called jackknife replicate, a weight is added to the data file where within one sampling zone at a time one PSU receives a double weight and the other a zero weight.

For each year level sample, 135 replicate weights were computed regardless of the number of sampling zones, allowing for 270 schools (or pseudo-schools) per year level. In Year 10, which has fewer sampling zones, the remaining replicate weights were equal to the original sampling weight.

In order to compute the sampling variance for a statistic t , it is estimated once for the original sample S and then for each of the jackknife replicates. The JRR variance is computed using the formula

$$Var_{jrr}(t) = \frac{1}{H} \sum_{h=1}^H [t(J_h) - t(S)]^2$$

where H is the number of sampling zones, $t(S)$ the statistic t estimated for the population using the original sampling weights, and $t(J_h)$ is the same statistic estimated using the weights for the h th jackknife replicate. The standard error for t is

$$\sigma(t) = \sqrt{Var_{jrr}(t)}$$

The computation of JRR variance can be obtained for any statistic. Standard statistical software does generally not include any procedures for replication techniques. For the NAPICTL08, SPSS macros were used to estimate JRR variance for means and percentages.

Population statistics on 'ICT Literacy' from the data were always estimated using all five plausible values. If θ is 'ICT Literacy' and θ_i is the statistic of interest computed on one plausible value, then:

$$\theta = \frac{1}{M} \sum_{i=1}^M \theta_i$$

with M being the number of plausible values.

The sampling variance U is calculated as the average of the sampling variance for each plausible value U_i :

$$U = \frac{1}{M} \sum_{i=1}^M U_i$$

Using these five plausible values for data analysis also allows for the calculation of the estimation of the amount of error associated with the measurement of 'ICT Literacy' due to the lack of precision of the test. The measurement variance or imputation variance B_M was computed as:

$$B_M = \frac{1}{M-1} \sum_{i=1}^M (\theta_i - \theta)^2$$

Sampling variance and imputation variance were computed as:

$$V = U + \left(1 + \frac{1}{M}\right) B_m$$

with U being the sampling variance. The final standard error is computed as :

$$SE = \sqrt{V}$$

Reporting of mean differences across States and Territories

The National Assessment Program – ICT Literacy Years 6 and 10 Report 2008 included comparisons of assessment results across states and territories. That is, means of scales and percentages were compared in graphs and tables. Each population estimate was accompanied by its confidence interval. In addition, tests of significance for the difference between estimates were provided, in order to describe the probability that differences were just a result of sampling and measurement error.

The following types of significance tests were reported:

- For differences in population estimates between states and territories; and,
- For differences in population estimates between subgroups.

Multiple comparison charts allow the comparison of population estimates between one state or territory and other states or territories. Some of the results from significance tests include an adjustment for multiple comparisons using a Dunn-Bonferroni adjustment. This is done as the probability of erroneously stating significant differences (the so-called Type I error) increases with the number of simultaneous comparisons.

If one wants to test the significance between two means at the .95 level, a critical value of 1.96 is used for the test statistics. Any value higher than the critical value indicates that there is a .95 probability that this difference is not the result of sampling error. Conversely, there is a .05 chance that a difference was found that does not exist. When several means are compared with each other at the same time, the probability of making a Type I error is the product of the probabilities for each comparison. Thus, the chance to make such an error increases with the number of comparisons.

Multiple comparisons in the NAPICTLO8 study between averages in jurisdictions were displayed with and without so-called Dunn-Bonferroni adjustment. Significant tests were carried out using the critical value of 1.96 ($p > .01$) but also increasing the critical value for significance tests to account for the fact that seven simultaneous multiple comparisons were made. Here, the critical value used was 2.7.

Differences between state or territory means were considered significant when the test statistic t was greater than the critical value. The value of t is calculated by dividing the difference by its standard error that is given by the formula:

$$SE_{dif_ij} = \sqrt{SE_i^2 + SE_j^2}$$

where SE_{dif_ij} is the standard error of the difference and SE_i and SE_j are the sampling standard errors of the compared states/territories i and j .

Reporting of mean differences across subgroups other than States and Territories

The formula for calculating the standard error provided above is only suitable when the sub-samples being compared are independent (see the PISA Data Analysis Manual: SPSS, Second Edition, 2009). As subgroups other than state or territory are not independent samples, the difference between statistics for subgroups of interest and the standard error of the difference were derived using specialist software⁵ designed to automate the macros provided in the PISA Data Analysis Manual (2005). Differences between subgroups were considered significant when the test statistic t was greater than the critical value, 1.96. t was calculated by dividing the difference by its standard error.

Reporting of differences across cycles – 2005 to 2008

The National Assessment Program – ICT Literacy Years 6 and 10 Report 2008 also included comparisons of assessment results across cycles. As the process of equating the tests across the cycles introduces some additional error into the calculation of any test statistic, an equating error term was added to the formula for the standard error of the difference (between cycle means, for example).

⁵ SPSS module and macros available from the *Public Data & Analysis* page of <https://mypisa.acer.edu.au/index.php>.

The value of the equating error between 2005 and 2008 is 4.35 units of the ICT Literacy scale. When testing the difference of a statistic between the two assessments, the standard error on the difference is computed as follows:

$$SE(\mu_{07} - \mu_{04}) = \sqrt{SE_{07}^2 + SE_{04}^2 + EqErr^2},$$

where μ can be any statistic in units on the ICT Literacy scale (mean, percentile, gender difference, but not percentages) and SE is the respective standard error of this statistic.

To report the significance of differences between percentages at or above proficient standards, the equating error for each year level could not directly be applied. Therefore, the following replication method was applied to estimate the equating error for percentages at proficient standards.

For each year level cut-point that defines the corresponding proficiency standard (410 for Year 6 and 529 for Year 10), a number of N replicate cut-points were generated by adding a random error component with a mean of 0 and a standard deviation equal to the estimated equating error of 4.35 score points. Percentages of students at or above each replicate cut-point (ρ_n) were computed and an equating error for each year level was estimated as:

$$EquErr(\rho) = \sqrt{\frac{(\rho_n - \rho_o)^2}{n}},$$

where ρ_o is the percentage of students at or above the (reported) proficient standard. The standard errors for the differences between percentages at or above proficient standards were calculated as:

$$SE(\rho_{07} - \rho_{04}) = \sqrt{SE(\rho)_{07}^2 + SE(\rho)_{04}^2 + EquErr(\rho)^2}$$

Other statistical analyses

Regression Analysis

Two multiple regression analyses were undertaken in order to explain variance in performance on the ICT Literacy Scale, using multiple regression modelling. Student achievement was regressed on student background characteristics.

The selected background variables were:

- Age (centred around the mean age) ;
- Gender (with girls coded as 0 and boys as 1);
- Indigenous status (with non-indigenous coded as 0 and Indigenous as 1);
- Language background other than English (with speakers of English coded as 0 and others as 1);

- Parental occupation⁶. Due to parental occupation being 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)⁷. The four groups were senior managers and professionals; other managers and associate professionals; tradespeople and skilled office; and sales and service staff. The reference category was unskilled labourers, office, sales and service staff and the regression coefficients for the other occupational groups can be interpreted as indicating the effects relative to the reference group;
- Geographic location of the school. This was also represented as a set of dummy variables (coded as 0 or 1 to reflect whether the school was located in a regional or remote area). Metropolitan location was the reference category and the results reported are relative to students in a metropolitan location; and
- Seven dummy indicators for states and territories, with Queensland as a reference category.

For the second regression model, the following additional variables on ICT familiarity were included:

- Computer Experience (in approximate years of experience);
- Usage of computers at home (approximate days per months);
- Usage of computers at school (approximate days per months);
- Application: Utilities (scale score with a mean 0 and standard deviation of 1 in Year 6);
- Application: Entertainment (scale score with a mean 0 and standard deviation of 1 in Year 6);
- Application: Social Communication (scale score with a mean 0 and standard deviation of 1 in Year 6);
- Application: Technology (scale score with a mean 0 and standard deviation of 1 in Year 6); and,
- Interest in computers (scale score with a mean 0 and standard deviation of 1 in Year 6).

For both multiple regression models, blocks of predictors were formed where each block consisted of a number of predictor variables. At each year level, predictor blocks were entered stepwise and the incremental explained variance ($R^2 * 100$) was reported for each block and the total explained variance by each model. Students with one missing value on at least one of the variables were excluded, which resulted in excluding about five per cent of the students in each year level for both models.

⁶ The measure of parent occupation was as provided by students for one parent or the higher-coded occupation in cases where data regarding two parents was supplied.

⁷ 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.

Summary

In NAP-ICTL 2005 a reporting scale for ICT Literacy was constructed by transforming the natural logit metrics from the scaling process so that the ICT literacy reporting scale had a mean score of 400 and a standard deviation of 100 for Year 6 students. This reporting scale was used as a basis for reporting scores in NAP-ICTL 2008 overall and when comparing jurisdictions as well as a other groups of students. In addition a series of scales that reflected computer use were developed using Rasch methods. In comparing mean scores for groups of students account needed to be taken of the uncertainty associated with each mean. In a complex sample such as this the standard errors and confidence intervals associated with each statistic were computed using Jackknife replication methods that take account of clustering in the sampling process as well as other characteristics of the sample.

REFERENCES

- Adams, R.J., & Wu, M. L. (2002). *PISA 2000 Technical Report*. Paris: OECD.
- Data implementation manual for enrolments for the 2007 school year*. (2006). Performance Measurement and Reporting Taskforce: Ministerial Council on Education, Employment, Training and Youth Affairs.
- Gonzalez, E.J. and Foy, P. (2000). Estimation of Sampling Variance. In: M.O. Martin, K.D. Gregory and S.E. Semler (Eds.). *TIMSS 1999 Technical report*. Chestnut Hill, MA: Boston College.
- Jones, R. (2004). *Geolocation Questions and Coding Index*. Performance and Reporting Taskforce: Ministerial Council on Education, Employment, Training and Youth Affairs
- Kish, L. (1965). *Survey Sampling*. New York: John Wiley & Sons.
- Masters G. N. (1988). Measurement Models for Ordered Response categories. In: Langeheine R. & Rost, J. (Eds). *Latent Trait and Latent Class Models* (pp 11-29). New York: Plenum Press.
- Masters, G. N. and Wright, B. D. (1997). The Partial Credit Model. In: van der Linden, W. J. and Hambleton, R. K. (Eds.). *Handbook of Modern Item Response Theory* (pp. 101–122). New York/Berlin/Heidelberg: Springer.
- Mislevy, R. J. and Sheehan, K. M. (1987). Marginal estimation procedures. In A. E. Beaton (Ed.), *The NAEP 1983-1984 technical report* (pp. 293-360). Princeton, NJ: Educational Testing Service.
- Monseur, C. and Berezner, A. (2007). The Computation of Equating Errors in International Surveys in Education. *Journal of Applied Measurement*, 8(3), 323-335.
- Muthén, L. K., & Muthén, B. O. (1998-2007). *Mplus User's Guide* (4th ed.). Los Angeles, CA: Muthén & Muthén.
- OECD. (2005). *PISA 2003 Technical Report*. Paris: OECD.
- OECD. (2009). *PISA 2006 Technical Report*. Paris: OECD.
- Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. Copenhagen: Nielsen and Lydiche.
- Wolter, K.M. (1985). *Introduction to Variance Estimation*. New York: Springer-Verlag.
- Wu, M. L., Adams, R. J., Wilson, M. R., and Haldane, S.A. (2007). *ACERConQuest Version 2: Generalised item response modelling software* [computer program]. Camberwell: Australian Council for Educational Research.

APPENDICES

APPENDIX A
STUDENT BACKGROUND SURVEY

Q1 How long have you been using computers?

(Please tick only one box.)

- Less than one year or never.
- One to three years.
- Three to five years.
- More than five years.

Q2 What type of computer systems do you use in these places?

(Please <tick> as many boxes on each row as apply for your use at that place.)

	<i>Windows (PC)</i>	<i>Apple Macintosh (OS)</i>	<i>Linux</i>	<i>none</i>
At home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At other places (e.g. local library)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q3 How often do you use a computer in these places?

(Please <tick> one box on each row.)

	<i>At least once every day</i>	<i>Almost every day</i>	<i>A few times each week</i>	<i>Between once a week and once a month</i>	<i>Less than once a month</i>	<i>Never</i>
At home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At other places.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q4 How often do you:

(Please <tick> one box on each row.)

	<i>At least once every day</i>	<i>Almost every day</i>	<i>A few times each week</i>	<i>Between once a week and once a month</i>	<i>Less than once a month</i>	<i>Never</i>
search the Internet to for information for study or school work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
search the Internet for information that is not for study or school work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use word processing software to write documents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use spreadsheets?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use mathematics, language or other learning programs on a computer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q 5 How often do you:

(Please <tick> one box on each row.)

	<i>At least once every day</i>	<i>Almost every day</i>	<i>A few times each week</i>	<i>Between once a week and once a month</i>	<i>Less than once a month</i>	<i>Never</i>
download games other software applications from the internet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
download or stream music and/or podcasts from the Internet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
play games on a computer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use software to create, sounds/music, movies or animations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use a computer to listen to music or watch DVDs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6 How often do you:

(Please <tick> one box on each row.)

	<i>At least once every day</i>	<i>Almost every day</i>	<i>A few times each week</i>	<i>Between once a week and once a month</i>	<i>Less than once a month</i>	<i>Never</i>
use a computer for email or “chatting”?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
write or reply to blogs or forum threads?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
upload text, images or video to an online profile?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use voice chat (VOIP) to communicate with friends online?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
play multiplayer games over the Internet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q7 How often do you:

(Please <tick> one box on each row.)

	<i>At least once every day</i>	<i>Almost every day</i>	<i>A few times each week</i>	<i>Between once a week and once a month</i>	<i>Less than once a month</i>	<i>Never</i>
write computer programs or macros?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
upload media you have created to Internet for others to enjoy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
construct websites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
store digital photos on a computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
use drawing, painting or graphics programs on a computer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q8 Thinking about your experience with computers: To what extent do you agree or disagree with the following statements?

(Please <tick> one box on each row.)

	<i>Strongly agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly disagree</i>
It is very important to me to work with a computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think playing or working with a computer is really fun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use a computer because I am very interested in the technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I lose track of time when I am working with the computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I am using a computer nothing else matters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I need a computer to help me do my work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time goes quickly when I am using a computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q 9 Are you a male or female?

Male

Female

Q10 Where do you live?

Please write in the spaces below the name of the suburb, town or locality where you live (not your address) and postcode of your permanent home address.

If you are living away from home please think of your permanent home address.

If you have a Post Office Box, please think of your home rather than the Post Office Box address.

The name and postcode of the suburb, town or locality where you live:	
Name: _____	Postcode: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Q 11 What is your age in years and months?

_____ Years	_____ Months
--------------------	---------------------

Pull down menus for: Years running from 8 years to 19 years, and months running from 0 months to 11 months

Q 12 Are you of Aboriginal or Torres Strait Islander origin?

*(Please tick **only one box**)*

No

Yes, Aboriginal

Yes, Torres Strait Islander

Yes, both Aboriginal and Torres Strait Islander

Q 13 In which country were you born?

Australia

Other,

please specify country:

Q 14 Do you or your parents/guardians speak a language other than English *at home*?

	You	Your father/ male guardian	Your mother/ female guardian
No, English only	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Please specify language	<input type="text"/>	<input type="text"/>	<input type="text"/>

Q 15 What is your father's/male guardian's main job? (e.g., school teacher, cleaner, sales assistant)
If he is not working now, please tell us his last main job.

What does your father male guardian do in his main job? (e.g., Teaches school students, cleans offices, sells things)

*If he is not working now, please tell us what he did in his last main job.
Please describe the kind of work he does or did in that job.*

Q 16 What is your mother's/female guardian's main job? (e.g., school teacher, cleaner, sales assistant)
If he is not working now, please tell us his last main job.

What does your mother/ female guardian do in his main job? (e.g., Teaches school students, cleans offices, sells things)

*If he is not working now, please tell us what she did in his last main job.
Please describe the kind of work he does or did in that job.*

APPENDIX B SAMPLE CHARACTERISTICS

Table B1 National Percentage Distribution of Sample Characteristics (Weighted)

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

Table B2 Percentage Distribution of Year 6 Sample Characteristics for Jurisdictions

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

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

Table B3 Percentage Distribution of Year 10 Sample Characteristics for Jurisdictions

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

APPENDIX C
SURVEY ADMINISTRATION DOCUMENTS

Document C1. Letter to Principal

t: 02 8338 6800
e: freeman@acer.edu.au

05 September 2008

The Principal
Address 1
Address 2

Facsimile:

Re: National Assessment Program – Information and Communications Technology (NAP-ICT) Literacy 2008

Dear Principal,

I understand that your department of education or sector authority has contacted you recently about your school's participation in the main survey of the National Assessment Program – Information and Communications Technology (NAP-ICT) Literacy tests in October/November 2008.

ACER thanks you in advance for supporting the survey at your school and looks forward to your school's participation in the NAP-ICT Literacy assessment.

The purpose of this letter is to seek confirmation of your willingness to participate in the NAP-ICTL 2008 study and to initiate the communication between ACER and your school regarding the assessment.

The main study will be conducted during October and November 2008. In your school the survey will involve students in Year 10 in a 90 minute "hands on" test of ICT skills, knowledge and understanding that concludes with a brief survey.

ACER will provide a representative (a registered teacher with the clearances required by your jurisdiction) to administer the tests with the students.

ACER will select, at random, 20 students from Year 10 to sit the test. The students will sit the test on the same day. Each test session takes 2 hours, including instruction time and practice time. Ten students will sit the test in a morning session and the remaining 10 students will sit the test in an afternoon session.

ACER has been asked, where possible, to use school computers to carry out the testing. In schools where 10 networked Windows computers are available in the assessment room, the test will be carried out using those computers.

In schools where fewer than 10 networked Windows computers can be provided in a suitable assessment room, the ACER Test Administrator will bring notebook computers on which the

testing will be conducted. This will require a room to be provided for the Test Administrator to set up the notebook computers as a mini lab for the day.

ACER will provide feedback on the performance of students in the tests in late November 2008.

In order to commence our planning for the implementation of the survey in your school, ACER needs to collect information regarding a suitable person to be the School Contact for the test. That person will coordinate the test in your school, and will need to be easily contacted by email and phone.

Please complete the enclosed **Fax Back Form** and return to ACER via fax by close of business Wednesday 10 September 2008.

Upon receipt of your advice, ACER will liaise with the School Contact to progress the flow of information in preparation for the survey. As a courtesy, you will be copied into all correspondence with the school contact.

Please call me on 1800 762 022 if you would like further information about the NAP-ICTL survey of 2008.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Chris Freeman', with a stylized flourish at the end.

Chris Freeman
General Manager, Systemwide Testing

Document C2. Letter to School Contact

t (02) 8338 6808
e arthur@acer.edu.au
Ref: NAP-ICT 2008

14 August 2008

School Contact name
Address 1
Address 2

Facsimile: 08 8370 5819

Re: NAP-ICT Literacy Assessment

Dear [School Contact Officer]

Thank you for agreeing to coordinate the National Assessment Program ICT (NAP-ICT) Literacy assessment in your school.

This letter is to provide you with further information about the NAP-ICT Literacy assessment and to request information that will enable the NAP-ICT Project Team to prepare for the assessment in your school.

The enclosed *NAP-ICT Literacy Assessment 2008 School Contact's Guide* provides an overview of the assessment and describes what you will need to do to ensure that the testing in your school runs smoothly.

I have emailed an Excel form to you. **Will you please complete that form and email it back to me at ICTL@acer.edu.au by Wednesday, 27 August?**

You will need the following information to complete the form:

- The school's preferred dates for the assessment and any dates during the assessment period when testing would not be possible. (Page 7 of the School Contact's Guide has a list of the test dates for each State and Territory.)
- The screen resolution of the computers to be used in the assessment and the bandwidth of the internet connection to those computers (your school's network manager will be able to give you that information.)
- The names of all students in Year 10 at your school.

The NAP-ICT Project Team will use this information to select an assessment day for your school, to choose the method for conducting the test in your school, and to select, at random, the twenty students who will take part in the assessment and several “reserves” in case of any student absences on the day. We will send these details to you in early September, along with brochures for the parents of children who will participate in the assessment.

As the School Contact you will also be responsible for coordinating the assessment activities within your school. These include:

- Scheduling the assessment and booking a room – with an appropriate number of networked computers (if applicable) – for the assessment sessions
- Notifying teachers, students and parents about the test, according to the school’s policies
- If school computers will be used for the test: checking that all of the computers and the internet link to be used in the test are working, and arranging for the school’s network administrator to be at the test room from 8:30am to 10:00am on test day
- Assisting the Test Administrator(s) with final arrangements on test day so that he/she can conduct the test sessions. You are not required to be present during the test sessions.

Please refer to the School Contact’s Guide to familiarise yourself with the role of School Contact.

Thank you again for your willingness to help and for your time and effort in coordinating the assessment in your school.

Please call the NAP-ICT Project Team on 1800 762 022 if you would like further information about the assessment.

Yours sincerely

Phillip Arthur
Manager, System Testing

Cc: The Principal



NAP-ICT Literacy Assessment 2008

School Contact's Guide

School: **xxx**

School projectID: **xx** School Contact: **xxxxx**

DETAILS TO BE ADVISED IN SEPTEMBER 2008	
Assessment Date and Times	
Assessment Session 1	_____
Assessment Session 2	_____
Test Administrator name:	_____
Test Administrator phone numbers:	_____

Checklist

Activity	Guide Reference	Schedule
<input type="checkbox"/> Familiarise yourself with the role of School Contact	Section 1	Now
<input type="checkbox"/> Provide ACER with information about the computers and internet link to be used for the tests (if applicable)	Section 2	By 16 September 2008
<input type="checkbox"/> Nominate preferred dates for the test and indicate students eligible for the test on the attached Excel w/sheet	Section 3	Return attached Excel worksheet by 16 September 2008
<input type="checkbox"/> Organise and confirm test plans	Section 4	September 2008
<input type="checkbox"/> Complete and return the student background information form (Year 6 students only)	Section 4	September 2008
<input type="checkbox"/> Confirm arrangements with the Test Administrator	Section 5	In the fortnight before test day
<input type="checkbox"/> Check the computers in the room to be used for the assessment are all working (if relevant)	Section 6	2 weeks before test day
<input type="checkbox"/> Assist the Test Administrator on test day, and – if school computers are to be used for the assessment – ensure the network administrator will be at the test room between 8:30 am and 10:00 am	Sections 7 & 8	Test day

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INTRODUCTION

National Assessment Program: Information and Communication Technology Literacy

In October and November 2008, samples of Year 6 and Year 10 students in schools across Australia will participate in a national sample assessment of Information and Communication Technology (ICT) Literacy, one of a set of assessments in the National Assessment Program.

The National Assessment Program is an ongoing program of sample assessments to monitor progress towards the National Goals for Schooling in the Twenty-First Century, endorsed in April 1999 by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA).

The National Assessment Program – Information and Communication Technology (NAP-ICT) Literacy assessment measures and reports on the ability of students 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's Performance Measurement and Reporting Taskforce (PMRT) manages the NAP-ICT Literacy assessment, and the assessment contractor is the Australian Council for Educational Research (ACER).

Further information about the NAP-ICT Literacy assessment is available on the MCEETYA website at <http://www.mceetya.edu.au>.

Your school is in the sample of 600 schools selected to participate in the test, which will be conducted during the period October – November 2008. In your school, the test will involve 20 students in Year 10 in a 90 minute "hands on" assessment of ICT skills, knowledge and understanding that concludes with a brief survey.

ACER will select, at random, 20 students from Year 10 to sit the assessment. The students will sit the assessment on the same day. Each assessment session takes 2 hours, including instruction time and practice time. Ten students will sit the assessment in a morning session and the remaining 10 students will sit the assessment in an afternoon session.

ACER has been asked, where possible, to use school computers to carry out the assessment. In schools where 10 networked Windows computers are available in a single room (such as a classroom or computer lab), the assessment will be carried out using those computers. If those test computers have at least a 4Mbps internet connection ACER will use the school's internet link for the assessment. In those schools, ACER requests that the use of the internet is minimised during assessment times, as

the assessment system relies upon the test computers having a good internet connection. If the internet link to the test computers is less than 4Mbps ACER will connect a “server” notebook computer to the school network.

In schools where fewer than 10 networked Windows computers can be provided in a suitable room, the ACER Test Administrator will bring 10 notebook computers on which the assessment will be conducted.

ACER will provide feedback on the performance of students in the assessments. We plan to provide you with that feedback in December 2008.

The data collected will include each participating child’s name so that feedback can be given to the school regarding school performance on the tests. Information regarding individual student performance is strictly confidential and no individual student or school information is reported to education authorities.

In order to prepare for the test, ACER needs to collect information about the computers and internet connection to be used in the tests (if applicable), the school’s preferred dates for the assessment, and the names of students in Year 10. **(Please see sections 2 and 3 of this Guide.)**

SCHOOL CONTACT ROLE AND RESPONSIBILITIES

1. The Role of the School Contact

Each school participating in the test is asked to appoint a School Contact to liaise between the school and the NAP-ICT Literacy Assessment (NAP-ICT) Project Team at ACER.

The NAP-ICT Project Team will appoint a Test Administrator (a registered teacher with the clearances required by your jurisdiction) who will visit your school to conduct the assessment.

As the School Contact, you will be responsible for coordinating the test activities within your school. These include:

- Scheduling the assessment and booking a room – with an appropriate number of networked computers (if applicable) – for the assessment sessions
- Notifying teachers, students and parents about the test, according to the school's policies
- If school computers will be used for the test: checking that all of the computers and the internet link to be used in the test are working, and arranging for the school's network administrator to be at the test room from 8:30am to 10:00am on test day
- Assisting the Test Administrator(s) with final arrangements on test day so that he/she can conduct the assessment sessions. You are not required to be present during the test sessions.

The rest of this Guide describes these test activities. The Checklist, on the front cover, summarises these activities and provides references to the sections of the Guide that provide further detail.

If, after reviewing the information in this Guide, you have any questions or concerns, please contact the NAP-ICT Project Team at ACER:

NAP-ICT Literacy Assessment Information Line: 1800 762 022

NAP-ICT Literacy Assessment email: ICTL@acer.edu.au

2. Providing Details of the Computers and Internet Connection

The test can be run using school computers if the school has a room containing at least 10 networked Windows computers and preferably (but not necessarily) a reliable 4Mbps internet connection. Your principal has replied to ACER, indicating whether the school can provide such a room for the test.

If your school's computers will be used for the tests please complete the attached Excel form to provide the NAP-ICT Project Team with details of the test computers and internet connection. (Your school's network manager will be able to give you that information.)

3. Setting the Date for the Test and Providing Student Names

Please indicate on the attached Excel form your school's preferred dates for the test, selecting from the dates indicated in the table below.

State or Territory	Test Dates
ACT	27 October – 14 November 2008
NSW	20 October – 14 November 2008
NT	13 October – 31 October 2008
QLD	13 October – 14 November 2008
SA	20 October – 14 November 2008
TAS	1 October – 17 October 2008
VIC	13 October – 14 November 2008
WA	20 October – 14 November 2008

Please complete the Excel form by listing **all** students in Year 10.

For schools in which school computers will be used for the assessment

As it is essential that the school's computers work effectively with the assessment software, ACER requests that you please arrange for the school's network administrator to be available at the room in which the trial test will be carried out from 8:30am to 10:00am on the test day. In some cases the network administrator may also need to do some preparatory work on the school computers before the test day.

Your school will receive \$150 from ACER to help cover the costs associated with the work of the network administrator.

ACER will send information for the network administrator to you by mail.

Please keep the requirement for your network administrator to attend the test room between 8:30am and 10:00am in mind when indicating preferred dates for the assessment.

4. Organising and Confirming Test Plans

Before the assessment, you should:

- Inform relevant colleagues (including, if applicable, the network administrator), students and parents about the test and if necessary obtain any parental permissions according to the school's policy.
- Gather some books or magazines for students who finish the assessment ahead of schedule. This is important to help ensure the smooth running of the assessment and to minimise disruptions.
- Make sure that everything is set for the assessment (room, computers, network administrator support, date and times). The room should have capacity for all the students. Make sure the room has been reserved for the entire test day.
- If the date of the test needs to be changed, all those concerned should be informed as soon as possible. In particular, it is important to advise the NAP-ICT Project Team so that the Test Administrator can be advised in turn.

If Year 6 students from your school will be tested, at the time ACER send the list of selected students to you we will include a form to collect the following student background information

- Student gender
- Date of birth
- Country of birth
- Indigenous status
- Parent school education
- Parent non school education
- Parent occupation
- Student and Parent home language.

Please complete the form and return it to ACER as soon as possible after its arrival.

5. Confirming Arrangements with the Test Administrator

The NAP-ICT Project Team will confirm with you the date of the test in your school and the students selected to participate in the test.

The Test Administrator assigned to your school will contact you in the fortnight before the assessment date to:

- Confirm the time and location of the assessment session
- Discuss how to handle emergencies or problem situations
- Answer any remaining questions.

6. Checking the Computers and Internet Link

In the fortnight before the test, please check that all of the computers in the room to be used for the test are working.

7. Maintaining Security

Because some test components will be used in future assessment cycles, their security is of the utmost importance. School staff will therefore not have access to the assessment materials. After the assessment has concluded a set of school release materials will be released and available for all schools to access from the MCEETYA website.

8. Assisting the Test Administrator on Test Day

On the day of the test it is your responsibility to help the Test Administrator with final arrangements.

If school computers are to be used for the test, please check the network administrator will be at the test room between 8:30am and 10:00am.

You are asked to ensure that the students are ready to begin each assessment at the designated time. It is very important that all of the sample students are assessed. (ACER will identify several student “reserves”, in case some of the sample students are away on the test day.)

Your presence at the beginning of the assessment session, if possible, will help set the tone of the session and demonstrate the importance of the test.

During the test, members of the NAP-ICT Project Team will visit a number of randomly selected schools. The visitors will observe the test sessions. The visitors will be known as Quality Monitors.

**Your help with the test is essential to the success
of the NAP-ICT Literacy assessment program.**

**The NAP-ICT Project Team at ACER appreciate your willingness to help
and thank you for your time and effort.**

NAP-ICT Project Team at ACER

Free call: 1800 762 022

Fax: 02 9693 5844

Email: ICTL@acer.edu.au

APPENDIX D
EXAMPLE SCHOOL REPORTS AND EXPLANATORY MATERIAL

Ministerial Council on Education, Employment, Training and Youth Affairs

NAP - ICT Literacy 2008 - School Report

School Name school

Year 6

Item Set DVD Day

State Name state

<i>Item Code</i>	<i>Descriptor</i>	<i>% Correct</i>		<i>Max Score</i>
		<i>School</i>	<i>Sample</i>	
Q01	Open spreadsheet from desktop	70	35	1
Q02	Sort data according to specific criteria	0	6	1
Q03	Delete the three selected rows with the films rated M.	0	13	1
Q04	Hide a column within a spreadsheet	80	52	1
Q05	Use the computer to check the spelling	100	85	1
Q06	Display specified hidden toolbar.	10	17	1
Q07	Left align selected text	70	62	1
Q08	Underline selected text	100	73	1
Q09	Insert a table with four columns and four rows.	40	48	1
Q10	Report - Choose a suitable review	10	9	1
Q11	Report - Locate and record information from within website: Cost DVDs to Your Door	60	51	1
Q12	Report - Locate and record information from within website: Cost Flicsonline	60	47	1
Q13	Report - Locate and record information from within website: Security DVDs to Your Door	20	21	1
Q14	Report - Locate and record information from within website: Security Flicsonline	50	31	1
Q15	Report - Evaluate websites and recommend one	30	11	1
Q16	Report - End report in a suitable way	10	7	1
Q17	Recognise two problems of shopping online: Internet Security and Reliability of online shopping	70	45	2

NAP - ICT Literacy 2008 - School Report

School Name school

Year 6

Item Set Friend's PC

State Name state

Item Code	Descriptor	% Correct		Max Score
		School	Sample	
Q01	Choose and click on a search result according to given criteria.	54	40	1
Q02	Navigate website menus to locate a specified resource.	62	58	1
Q03	Select the strongest password according to length and range of character types.	85	52	1
Q04	Identify a benefit of saving a file from the Internet before running the file.	46	25	2
Q05	Give an example of what happens to anti-virus software when it is updated.	23	23	2
Q06	Navigate software menus and configure software settings.	69	41	1
Q07	Recognise the purpose of spyware.	31	33	1
Q08	Identify the main purpose of a software license agreement.	77	64	1
Q09	Use an installation wizard to install software to a specified folder.	46	32	1
Q10	Explain an advantage of storing photos on the Internet.	46	27	1
Q11	Explain a disadvantage of storing photos on the Internet.	38	29	1
Q12	Use sorting tools to order and filter data.	41	35	3
Q13	Locate and click on the Edit button to edit an image.	77	60	1
Q14	Use tools to rotate image 180 degrees.	77	78	1
Q15	Use tools (slide control) to brighten an image.	85	74	1
Q16	Crop an image to remove background.	54	56	1
Q17	Erase specified elements of an image.	77	72	1



NAP - ICT Literacy 2008 - School Report

Year 6

School School Name Item Set Friend's PC State State

Surname	Other Names	q01	q02	q03	q04	q05	q06	q07	q08	q09	q10	q11	q12	q13	q14	q15	q16	q17	Score on Item Set	
		Max Score	1	1	1	2	2	1	1	1	1	1	1	3	1	1	1	1	1	Individual
Astudent	First name	0	1	1	1	2	1	1	1	1	1	0	3	0	1	1	1	1	17	9
Bstudent	First name	1	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	12	9
Cstudent	First name	0	1	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	8	9
Dstudent	First name	0	0	1	1	-	1	0	0	-	0	1	-	-	-	-	-	-	4	9
Estudent	First name	0	0	0	1	1	-	0	1	-	0	0	0	1	-	-	-	-	4	9
Fstudent	First name	0	0	1	2	-	1	0	0	1	0	0	-	1	1	1	0	1	9	9
Gstudent	First name	1	1	1	1	2	0	0	1	0	0	1	1	1	1	1	1	1	14	9
Hstudent	First name	1	0	1	1	2	1	0	1	1	0	0	1	1	1	1	1	1	14	9
Istudent	First name	1	1	1	2	-	1	0	1	0	1	1	3	1	1	1	1	1	17	9
Jstudent	First name	1	1	1	0	0	1	0	0	1	0	0	0	-	1	1	0	1	8	9
Kstudent	First name	0	0	1	1	0	1	1	1	1	1	1	2	1	1	1	1	1	15	9
Lstudent	First name	1	1	1	1	0	0	1	1	0	1	0	1	1	1	1	0	1	12	9
Mstudent	First name	1	1	1	0	1	1	1	1	1	1	0	3	1	1	1	1	1	17	9

Key: "5" = Score 5 marks, "4" = Score 4 marks, "3" = Score 3 marks, "2" = Score 2 marks, "1" = Score 1 mark, "0" = Score 0 mark, "-" = no response,

APPENDIX E
STUDENT BACKGROUND VARIABLES USED FOR CONDITIONING

QUESTION AND RESPONSE CATEGORIES	CODING
Q1 How long have you been using computers?	
<i>Less than one year or never.</i>	1;0;0;0
<i>One to three years.</i>	0;1;0;0
<i>Three to five years.</i>	0;0;1;0
<i>More than five years.</i>	0;0;0;0
<i>Missing</i>	0;0;0;1
Q2 What type of computer systems do you use?	
(a) At home	
(b) At school	
(c) At other places (e.g. local library)	
(1) Windows (PC)	
(2) Macintosh (OS)	
(3) Linux	
(4) None	
<i>Tick</i>	1
<i>No tick</i>	0
Q3 How often do you use a computer in these places?	
(a) At home	
(b) At school	
(c) At other places	
<i>At least once every day</i>	0;0
<i>Almost every day</i>	1;0
<i>A few times each week</i>	2;0
<i>Between once a week and once a month</i>	3;0
<i>Less than once a month</i>	4;0
<i>Never</i>	5;0
<i>Missing</i>	mode;1
Q4 How often do you	
(a) search the Internet to for information for study or school work?	
(b) search the Internet for information that is not for study or school work?	
(c) use word processing software to write documents?	
(d) use spreadsheets?	
(e) use mathematics, language or other learning programs on a computer?	
<i>At least once every day</i>	0;0
<i>Almost every day</i>	1;0
<i>A few times each week</i>	2;0
<i>Between once a week and once a month</i>	3;0
<i>Less than once a month</i>	4;0
<i>Never</i>	5;0
<i>Missing</i>	mode;1

QUESTION AND RESPONSE CATEGORIES	CODING
Q 5 How often do you	
(a) download games other software applications from the internet?	
(b) download or stream music and/or podcasts from the Internet?	
(c) play games on a computer?	
(d) use software to create, sounds/music, movies or animations?	
(e) use a computer to listen to music or watch DVDs?	
<i>At least once every day</i>	0;0
<i>Almost every day</i>	1;0
<i>A few times each week</i>	2;0
<i>Between once a week and once a month</i>	3;0
<i>Less than once a month</i>	4;0
<i>Never</i>	5;0
<i>Missing</i>	mode;1
Q6 How often do you	
(a) use a computer for email or “chatting”?	
(b) write or reply to blogs or forum threads?	
(c) upload text, images or video to an online profile?	
(d) use voice chat (VOIP) to communicate with friends online?	
(e) play multiplayer games over the Internet?	
<i>At least once every day</i>	0;0
<i>Almost every day</i>	1;0
<i>A few times each week</i>	2;0
<i>Between once a week and once a month</i>	3;0
<i>Less than once a month</i>	4;0
<i>Never</i>	5;0
<i>Missing</i>	mode;1
Q7 How often do you	
(a) write computer programs or macros?	
(b) upload media you have created to Internet for others to enjoy?	
(c) construct websites?	
(d) store digital photos on a computer	
(e) use drawing, painting or graphics programs on a computer?	
<i>At least once every day</i>	0;0
<i>Almost every day</i>	1;0
<i>A few times each week</i>	2;0
<i>Between once a week and once a month</i>	3;0
<i>Less than once a month</i>	4;0
<i>Never</i>	5;0
<i>Missing</i>	mode;1

QUESTION AND RESPONSE CATEGORIES	CODING
Q8 Thinking about your experience with computers: To what extent do you agree or disagree with the following statements?	
(a) It is very important to me to work with a computer.	
(b) I think playing or working with a computer is really fun.	
(c) I use a computer because I am very interested in the technology.	
(d) I lose track of time when I am working with the computer.	
(e) When I am using a computer nothing else matters	
(f) I need a computer to help me do my work	
(g) Time goes quickly when I am using a computer	
<i>Strongly agree</i>	0;0
<i>Agree</i>	1;0
<i>Disagree</i>	2;0
<i>Strongly disagree</i>	3;0
<i>Missing</i>	mode;1
Q 9 Are you a male or female?	
<i>Male</i>	1;0
<i>Female</i>	0;0
<i>Missing</i>	0;1
Q10 Where do you live?	
<i>Geocode -1</i>	0;0;0
<i>Geocode -2</i>	1;0;0
<i>Geocode -3</i>	0;1;0
<i>Missing</i>	0;0;1
Q 11 What is your age in years and months?	
<i>Age in months</i>	months;0
<i>Missing</i>	mean;1
Q 12 Are you of Aboriginal or Torres Strait Islander origin?	
<i>No</i>	0;0
<i>Yes, Aboriginal</i>	1;0
<i>Yes, Torres Strait Islander</i>	1;0
<i>Yes, both Aboriginal and Torres Strait Islander</i>	1;0
<i>Missing</i>	0;1
Q 13 In which country were you born?	
<i>Australia</i>	0;0
<i>Other</i>	1;0
<i>Missing</i>	0;1
Q 14 Do you or your parents/guardians speak a language other than English at home?	
(a) You	
(b) Your father/male guardian	
(c) Your mother/female guardian	
<i>No, English only</i>	0;0
<i>Yes</i>	1;0
<i>Missing</i>	0;1
Q 15 What is your father's/male guardian's main job?	
<i>Parent Occupation</i>	(4=0)(3=1)(2=2)(1=3);0
<i>Missing</i>	mode;1
Q 16 What is your mother's/female guardian's main job?	
<i>Parent Occupation</i>	(4=0)(3=1)(2=2)(1=3);0
<i>Missing</i>	mode;1

APPENDIX F

ICT LITERACY PROFICIENCY LEVEL DESCRIPTORS AND EXAMPLES

Level	Proficiency level description	<i>Examples of student achievement at this level</i>
6	<p>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.</p>	<ul style="list-style-type: none"> • 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	<p>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.</p>	<ul style="list-style-type: none"> • create an information product in which the information flow is clear and logical and the tone and style are consistent and appropriate to a specified audience. • select and include information from electronic resources in an information product to suit an explicit communicative purpose. • use graphics and text software editing features such as font formats, colour and animations consistently within an information product to suit a specified audience. • create tables and charts that accurately represent data and include them in an information product with text that refers to their contents. • apply specialised software and file management functions such as using the history function on a web-browser to return to a previously visited page or sorting data in a spreadsheet according to a specified criterion.

Level	Proficiency level description	<i>Examples of student achievement at this level</i>
4	<p>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.</p>	<ul style="list-style-type: none"> • create an information product in which the flow of information is clear and the tone is controlled to suit a specified audience. • generate searches that target relevant resources and then select relevant sections of these resources to include, with some modification and supporting text, in an information product. • apply graphics and text software editing features such as, font formats, colour and image placement consistently across a simple information product. • apply infrequently used software and file management functions such as displaying a specified hidden toolbar in a word processor, edit text in an online survey, or using a single pull-down menu function or installation wizard to save files to a specified location. [Changed since NAP-ICTL 2005] • identify security risks associated with spyware and providing personal data over the internet and explain the importance of respecting and protecting the intellectual property rights of authors. [Changed since NAP-ICTL 2005]
3	<p>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.</p>	<ul style="list-style-type: none"> • create an information product that follows a prescribed explicit structure. • select clear, simple, relevant information from given information sources and include it in an information product. • use graphics and text software editing features to manipulate aspects such as colour, image size and placement in simple information products. • apply software and file management functions using common conventions such as left aligning selected text, adding questions to an online survey, or creating and naming a new file on the desktop. [Changed since NAP-ICTL 2005] • recognise the potential for ICT misuse such as plagiarism, computer viruses, and deliberate identity concealment and suggest measures to protect against them.

Level	Proficiency level description	<i>Examples of student achievement at this level</i>
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.	<ul style="list-style-type: none"> • locate explicit relevant information or links to information from within a web-page. • make changes to some presentation elements in an information product. • apply simple software and file management functions such as, copying and pasting information from one column of a spreadsheet to another column or adding a web-page to a list of favourites (bookmarks) in a web-browser or opening an email attachment. • recognise common computer use conventions and practices such as the use of the '.edu' suffix in the URL of a school's website, the need to keep virus protection software up-to-date and the need to maintain good posture when using a computer.
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	<ul style="list-style-type: none"> • apply graphics manipulation software features such as adding and moving predefined shapes to reproduce the basic attributes of a simple image. • apply basic file and computer management functions such as opening and dragging-and dropping files on the desktop. • apply generic software commands such as the 'save as' and 'paste' function, clicking on a hyperlink to go to a webpage, or selecting all the text on a page. [Changed since NAP-ICTL 2005] • 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.