NATIONAL ASSESSMENT PROGRAM

INFORMATION COMMUNICATION AND TECHNOLOGY LITERACY

YEAR 6 AND YEAR 10

TECHNICAL REPORT

2005

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CONTENTS

TABLES

FIGURES

National Assessment Program –

Information Communications and Technology Literacy
Year 6 and Year 10

TECHNICAL REPORT
2005

CHAPTER 1
INTRODUCTION

Project overview

In April 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 new *National Goals for Schooling in the Twenty-first Century.* The document became known as the 'Adelaide Declaration'. The National Goals provide the framework for reporting on student achievement and for public accountability by schools and school systems through the MCEETYA publication, the *Annual National Report on Schooling in Australia.*

In 1999, the Education Ministers established the *National Education Performance Monitoring Taskforce* (NEPMT) to develop key performance measures to monitor and report on progress toward the achievement of the Goals on a nationally-comparable basis. The NEPMT was subsequently renamed the *Performance Measurement and Reporting Taskforce* (PMRT)

Australia's national goals for schooling assert that when students leave school they should be: *confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society* (MCEETYA, 1999: Goal 1.6).

In August 2004 the PMRT issued an *Invitation to Offer* for the initial cycle of the national assessment of ICT Literacy. The Australian Council for Educational Research (ACER) was selected to conduct the assessment project.

For the purpose of the 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 (MCEETYA, 2005).

The PMRT set the policy objectives, commissioned the Benchmarking and Educational Measurement Unit (BEMU) to manage the assessment and established a Review Committee (consisting of members nominated by the jurisdictions, school sectors and interest groups) to facilitate discussion among the jurisdictions and school sectors.

ICT Literacy National Sample Assessment Survey

The ICT literacy domain specified for the project included six processes.

- *Accessing information* - identifying the information needed 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 about making 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 with others* - exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium.
- *Using ICT appropriately* - making critical, reflective and strategic ICT decisions and about using ICT responsibly by considering social, legal and ethical issues.

ICT Literacy Strands

BEMU coordinated the development of the assessment framework to guide the development of items to measure student performance in each 'strand'. The elements identified in the MCEETYA definition are clustered into three strands: working with information, creating and sharing information and using ICT responsibly. Strands A and B are logical process groupings of ICT use while Strand C focuses on understandings of responsible ICT use. The three strands of the ICT literacy domain are described below:

Strand A: Working with information

This strand includes identifying the information needed; formulating and executing a strategy to find information; making judgements about the integrity of the source and content of the information; and organising and storing information for retrieval and reuse.

Strand B: Creating and sharing information

This strand includes adapting and authoring information; analysing and making choices about the nature of the information product; reframing and expanding existing information to develop new understandings; and collaborating and communicating with others.

Strand C: Using ICT responsibly
This strand includes understanding the capacity of ICT to impact on individuals and society, and the consequent responsibility to use and communicate information legally and ethically.

These strands were articulated in detail so that they represented discrete hypothetical (or theoretical) constructs that provided the basis for item development. This process is described in greater detail in Chapter 2.

Participants in the assessment

Schools from all States and Territories, and from the government, Catholic and independent sectors, participated. A stratified sample of schools was selected with a probability proportional size and 15 students were sampled at random from within each school. Data were gathered from 3,746 Year 6 students from 264 schools and 3,647 Year 10 students from 249 schools. Table 1.1 records the number of schools and students, by State and Territory, in the final sample from which performance comparisons were reported.

Assessment format

The assessments were administered by trained test administrators in groups of 5 students in each administration session. Three sessions were conducted in each school on the day of the administration. In order to standardise the assessment environment all items were delivered using a lap top computer with an external mouse. Each individual student completed one common module and two modules assigned at random from a set of six

Reporting of the assessment results

The results of the assessment were reported in the *National Assessment Program – ICT Literacy Years 6 and 10 Report 2005* (MCEETYA, 2007). Mean scores and distributions of scores are shown at the national level and by State and Territory. The results are also described in terms of the understandings and skills that students demonstrated in the assessment, which are mapped against the ICT Literacy assessment domain (Appendix A).

Table 1.1 Designed sample and final participation rates by State and Territory

State / Territory	Year 6			Year 10		
	Designed school sample	Number and percentage[1] of sampled schools in participating	Number and percentage[2] of sampled students participating	Designed school sample	Number and percentage[1] of sampled schools in participating	Number and percentage[2] of sampled students participating
NSW	41	38 (93%)	534 (89%)	41	39 (95%)	541 (90%)
VIC	41	40 (98%)	575 (96%)	40	39 (98%)	593 (99%)
QLD	41	41 (100%)	574 (96%)	40	39 (98%)	562 (95%)
SA	42	41 (100%)	591 (100%)	41	40 (100%)	581 (97%)
WA	41	41 (100%)	570 (95%)	41	40 (98%)	557 (93%)
TAS	31	31 (100%)	447 (100%)	30	30 (100%)	428 (95%)
NT	16	16 (100%)	231 (92%)	15	11 (73%)	162 (79%)
ACT	16	16 (100%)	224 (96%)	15	15 (100%)	203 (90%)
AUST.	**269**	**264 (98%)**	**3746 (96%)**	**263**	**253 (97%)**	**3627 (94%)**

1 Percentage of eligible (non-excluded) schools in the final sample. Participating replacement schools are included.
2 Percentage of participating eligible (non-excluded) students in the final sample.

Structure of the Technical Report

This report describes the technical aspects of the National ITC 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 process of weighting 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 error.

CHAPTER 2
ASSESSMENT DOMAIN AND INSTRUMENT DEVELOPMENT

Developing the assessment domain

The assessment domain was developed by PMRT and BEMU from the Key Performance Measures articulated in the Adelaide Declaration (2002) and with reference to similar studies being carried out nationally and internationally as well as reference to the international literature. The content of the assessment domain was validated against existing State and Territory curriculum documents, and in consultation with ACER and the members of the ICT Literacy Review Committee comprising representatives of all states and jurisdictions and key stakeholder bodies including MCEETYA.

The ICTL Review Committee was presented with a draft assessment domain at its inaugural meeting early in 2004. It was subsequently revised by the Review Committee and ACER, undergoing minor amendment during the next six months. Final adjustments were made after the field trial in 2005 with the final version of the assessment domain approved by the Review Committee in July 2005. The assessment domain that guided the development of the instrument is shown in Table 2.1.

Application of ICT Literacy

The processes described in the ICT literacy definition are applied across all learning and real-life situations, are not restricted to using particular technologies, software and information products and are evident in a range of contexts and environments that a student may use. However, the first national sample assessment of ICT literacy in 2005 focused on the use of computers.

When developing assessment tasks for the first national sample assessment of ICT, evidence of ICT literacy could be drawn from, and applied in, the environments, information products, software and contexts indicated in Table 2.2. These contexts could be represented as simulated environments or as environments using the actual software necessary.

The ICT Literacy Assessment Instrument

The assessment was computer based and administered in an environment that was uniform for all students on identical computers. The assessment was administered using sets of six networked laptop computers (five were for students and one was for the test administrator) using MS Windows operating systems and with all necessary software installed. The software installed on each computer contained all the assessment modules and a management system that confirmed the identity of the selected student, asked basic registration information, assigned each student to the modules appropriate to their Year level (this was random within each Year level for students who demonstrated minimum competence on the initial module) and collected student responses to the survey questions[1].

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

Table 2.1 ICT Literacy Assessment Domain

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

Table 2.2 ICT Literacy Assessed Environments

Environments	The possible range of environments were: • stand-alone • network • online For the 2005 national sample assessment the network and online environments were to be closed or simulated.
Information products	Information products were to include and combine elements of numerical data, text, images, sounds and video. Examples of information products include: • print-based forms, such as a document, report that may include text, illustrations, graphs, etc • digital forms, such as multimedia, presentations, web pages that may include text, sound, video, etc • graphical and symbolic forms, such as charts, graphs, maps, etc • pictorial forms, such as photographs, drawings, etc.
Software	The range of software is: • internet and sourcing applications, such as email, browsers, online services and e-commerce • word processor • spreadsheet • database • multimedia tools • file management tools. The assessment tasks were intended to be constructed to utilise the variety of software platforms and brands that students have access to in their school.
Contexts	The range of contexts is: • personal • educational and vocational • societal.

The on-screen environment of the assessment instrument had three main sections: a surrounding border of test-taking information and navigation facilities; a central information section that can house stimulus materials for students to read or (simulated or live) software applications; and a lower section containing the instructional and interrogative text of the assessment items and the response areas for multiple-choice and constructed response items. The environment as seen by students is represented in Figure 2.1.

Test administrators travelled to each school with the networked computers to manage the process. The assessment was administered to groups of five students in each of three testing sessions during the school day.

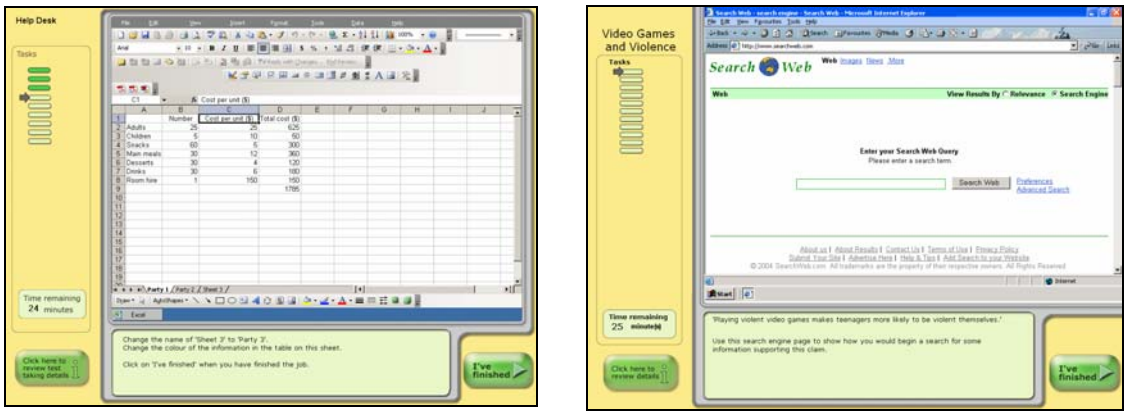

Figure 2.1 On-Screen Environment for ICT Literacy Assessment 2005

Structure of the instrument

The ICT assessment instrument was designed to model students' typical 'real world' use of ICT. Task authenticity was included in the ICT assessment instrument in two main ways. Firstly, students completed all tasks on computer using a seamless combination of simulated and live software applications. Secondly, the assessment items were grouped in thematically linked modules each of which followed a linear narrative sequence. The narrative sequence in each module typically involved students collecting and appraising information before synthesising and reframing the information to suit a particular communicative purpose and given software genre. The overarching narratives across the modules covered a range of school-based and out-of-school based themes. The assessment items were presented in a linear sequence to students. Students were not permitted to return to previously completed items as, in some cases, later items in a sequence provide clues or even answers to earlier items.

Assessment item types

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

There were five distinct types of assessment items or tasks in the ICT literacy assessment instrument. Within the assessment students were asked to:

- answer multiple-choice questions to assess knowledge;
- perform specific functions within simulations of software products to assess skill with applications such as Microsoft Windows, Word and Internet Explorer;
- provide constructed responses to specific questions;
- perform complex multi-stage tasks using an actual single software application to produce an information product; and
- create work products using live multiple applications for evaluation using standardised rubrics by trained assessors.

The item type used for each item was determined by the substance of the item and the capacity of the available software to manage the full functionality of the item. It was neither necessary nor possible to predetermine the proportion of item types within each module or across the assessment instrument as a whole. The different types of items access different types of student achievement information across the three ICT literacy strands. The item types, the type of information they access and their technical properties are summarised in Table 2.3. The assessment instrument combined multiple item types within a single, consistently administered assessment.

Table 2.3: Summary of ICT Literacy Assessment Task Types, Information Accessed and Technical Properties

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

Items and modules

The assessment instrument was based on seven discrete thematic modules. One module, the General Skills Test, included only simulation and multiple-choice assessment items. Six of the modules, the Hybrid Assessment Modules (HAMs), integrated conventional simulation, multiple-choice and constructed response items with live application software. All students first completed the General Skills Test and then two HAMs. One reason for conducting the assessment with a number of HAMs was to ensure that the assessment instrument accesses what is common to the ICT construct across a sufficient breadth of authentic contexts. Figure 2.2 shows the workflow from registration through assessment to completion.

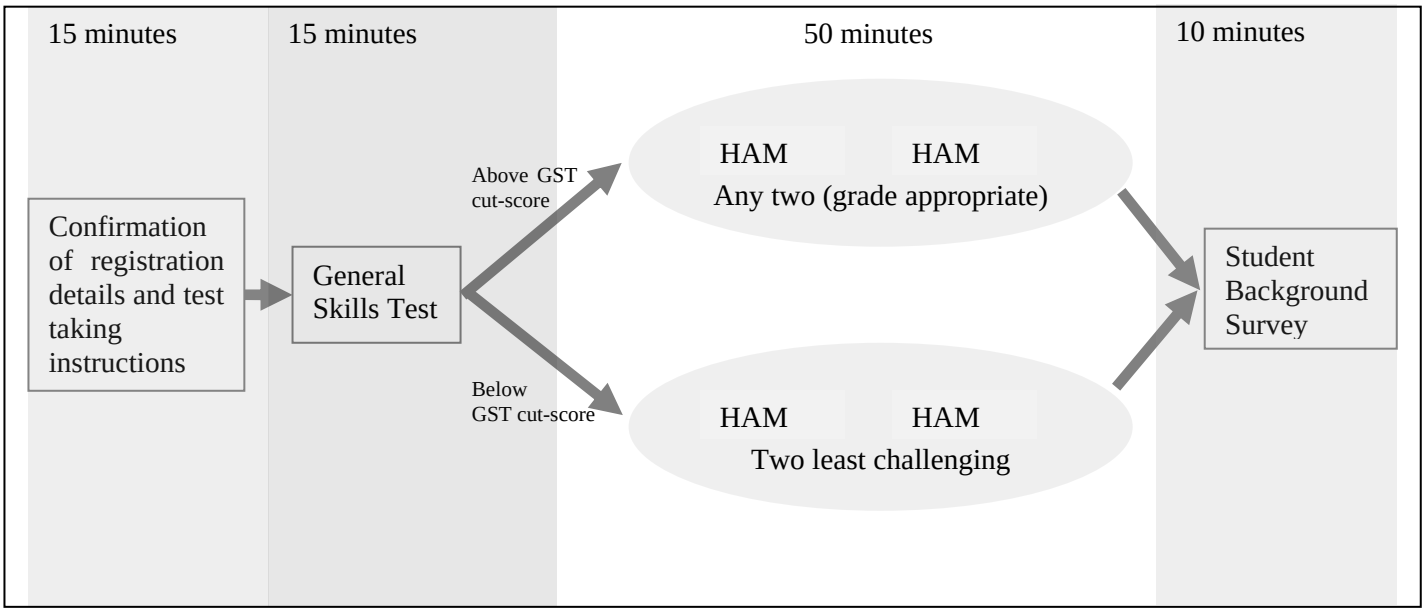

Figure 2.2 Workflow through the ICT literacy assessment

The General Skills Test

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

The Hybrid Assessment Modules

Students who demonstrated at least basic proficiency on the General Skills Test were randomly allocated any two Grade level appropriate HAMs. In the final survey, approximately 90 per cent of Year 6 and 99 per cent of Year 10 students demonstrated basic proficiency on the General Skills Test. Each HAM had a single unifying theme. Five of the six HAMs followed a basic structure in which the software skills performance, multiple-choice and short constructed response items form the lead up to a single large task using at least one live software application[2]. Typically the lead-up tasks require students to: manage files; perform simple software functions (such as inserting pictures into files); search for information; collect and collate information; evaluate and analyse information; and perform some simple reshaping of information (such as drawing a chart to represent numerical data). The large tasks outlined in Table 2.4 that provided the global purpose of five of the six HAMs are completed using live software. When completing the large tasks, students typically needed to select, assimilate and synthesise the information they have been working with in the lead-up tasks and reframe the information to fulfil a specified communicative purpose. The audience and software related communicative context are specified to the students as part of the communicative purpose of each large task. Students spent between 40 per cent and 50 per cent of the time allocated for the module on the large task.

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

Table 2.4 Hybrid Assessment Modules and Large Tasks

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

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

Summary

The national assessment of ICT literacy was based on a definition that emphasised accessing, managing, integrating and evaluating information as well as developing new understandings, and communicating with others. These were seen as essential for effective participation in information society. The key elements of this definition made up three strands that postulated how students would be expected to progress in ICT. These strands and the levels within them formed the basis for the development of tasks that represented the ICT Literacy domain. The assessment was administered on identical computers to students in Year 6 and Year 10. Different types of item were incorporated in the assessment including simulated screens and authentic tasks that used "real" software applications. The items were organised in modules designed to represent different contexts. Each individual student completed one common module and two modules assigned at random from a set of six.

CHAPTER 3
SAMPLING AND WEIGHTING

The target populations for the study were Year 6 and Year 10 students enrolled in educational institutions across Australia. Estimates of ICT Literacy in these populations were generated by administering computer-based assessments to samples of students from those two Year levels in samples of schools.

Samples are often used in surveys of student achievement so as to minimise the burden of assessments on students and schools and to maximise the efficient use of resources for data collection, processing and analysis. Sample data can then be used as the basis for making inferences about the population being studied provided that the sample has been drawn according to clearly defined and well-established principles. When inferences about a population are made on the basis of data from a sample there is an associated level of uncertainty associated with those estimates. This is because there is a chance that the sample might not precisely represent the population. The level of uncertainty can be estimated and is represented as the standard error or the confidence interval associated with the estimate of the parameter in the population. In complex survey designs such as those employed in National Assessment Program Sample Surveys some groups of schools (typically the smaller States and Territories) are represented to a greater extent than would be proportional to their representation in the population. This differential sampling is done in order to provide estimates similar precision for all States and Territories. When disproportionate sampling is used it is necessary to weight the sample data so as to obtain unbiased estimates for the population as a whole.

This chapter outlines the basis for the sample design for NAP-ICTL05, characteristics of the sample that was achieved, the extent of clustering within the sample, the weighting procedures that were applied and the estimation of confidence intervals.

Sampling Design

Sampling for NAP-ICTL05 followed the sampling procedures established for national sample surveys conducted by the *Performance Measurement and Reporting Taskforce* (Murphy & Schulz, 2006). These surveys involve a multiple stage approach that is also referred to as cluster sampling[3]. This approach is similar to that used by international assessments such as the Trends in International Mathematics and Science Study (TIMSS) and the OECD Programme for International Students Assessment (PISA). At the first stage, a group of schools is selected, and then at the second stage a group of students is selected from within the sampled schools[4].

Sampling schools

In the first stage of NAP-ICTL05 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 sample of schools was drawn from a sampling frame that was stratified explicitly by State or Territory and sector and implicitly by location. The national school

[3] An advantage of cluster sampling is that a larger group of students from the same school can be surveyed at the same time, rather than possibly just one or two students if a simple random sample of students from the population were to be drawn. Cluster samples also allow for multi-level analyses of data, where the level of the school or the class within the school can be incorporated into the survey analysis and limit the burden of the survey to the set of schools sampled for the project.

[4] The selection of students within schools may be split into separate steps. Some other NAP surveys involve the selection of a class at a Year level, and then the selection of individual students from that class.

sampling frame is a comprehensive list of all schools in Australia, developed by the Australian Council of Educational Research (ACER) by coordinating information from multiple sources, including the Australian Bureau of Statistics and State and Territory education department databases. Schools were selected at random but with a probability proportional to their enrolment at the relevant Year level. A similar number of schools from each of the mainland States and Territories were selected so as to ensure a similar level of precision in the estimates derived from those samples[5]. A weighting process compensated for this disproportionate sampling of schools and for any differences among schools in the actual numbers of students who participated in the survey. A small number of schools were excluded from the selection process[6].

Sampling Students

In the second stage, 15 students were selected at random from a school-provided list of all eligible students from the Year level[7]. If there were fewer than 15 students in the school all those students were selected. A further three students were selected at random as potential for students who were absent so as to ensure maximum participation at school level. At the same time a list of replacement students was selected in case one or more of the students declines to participate or is absent on the day of testing. By selecting students at random from the Year level, and by selecting only 15 students per school, the sample had enhanced precision over a sample of the same number of students based on selecting intact classes because the effects of students being in classes similar to each other was reduced[8].

Planning sample size

For both the Year 6 and Year 10 samples, sample sizes were determined that would provide accurate estimates of achievement outcomes for all states and territories (with 95 per cent confidence limits of +/- 0.10 to +/-0.15 standard deviations for estimated means). This required an *effective sample size* (i.e. the size of a simple random sample that would produce the same precision as the complex sample design) in the larger states of around 140 students. A smaller sample size was needed in the smaller states and territories because of the *finite population correction factor* (i.e. as the proportion of the total population surveyed becomes larger the precision of the sample increases for a given sample size).

The actual sample sizes required for each state and territory can be estimated by multiplying the desired effective sample size by the estimated *design effect* that reflects the effects of the complex sample design (Kish 1965, p. 162). In a complex, multi-stage sample such as the one selected for

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5 For example, 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.

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

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

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

this study, the clustering of the sample results in reduce precision because students within a school tend to be more like each other on most characteristics than students in general.

Any within-school homogeneity reduces the effective sample size. This homogeneity can be measured with the intra-class correlation, ρ, which reflects the proportion of the total variance in a characteristic in the population that is accounted for by clusters (classes within schools). Knowing the size of ρ and the size of each cluster's sample size *b*, the design effect for an estimate of a mean or percentage for a given characteristic $\bar{y}$ can be computed from:

$$D^2(\bar{y}) = 1 + (b-1)\rho$$

For the NAP-ICT Literacy 2005 the sampling was based on 15 Year 6 students and 15 Year 10 students sampled at random from each school. The ρ values were 0.19 for Year 6 and 0.16 for Year 10. These values and the value of the design effect are recorded in Table 3.1 along with corresponding values for other studies.

Table 3.1 Sample Characteristics for NAP-ICT Literacy 2005 and Other Studies

Project	Year level / age	Within- school sampling of students	Intra-class correlation (ρ)	Average cluster size	Design effect (DEFF)	DEFT (√DEFF)
NAP-ICTL05	Year 6	Random	0.19	14.2	3.5	1.9
NAP-ICTL05	Year 10	Random	0.16	14.3	3.1	1.8
PISA 2003 Maths	15-year-olds	Random	0.21	39.1	9.0	3.0
NAP-CCE04	Year 6	Intact classes	0.25	33.0	9.0	3.0
NAP-CCE04	Year 10	Intact classes	0.29	38.3	10.7	3.3
TIMSS 94 Maths	Year 4	Intact classes	0.23	36.3	9.1	3.0
TIMSS 94 Maths	Year 8	Intact classes	0.26	40.3	11.2	3.3

Note: For PISA 2003 where the sampling was based on a random sample of approximately 50 15-year-olds from each school the ρ value for mathematics was 0.21 (OECD: 2005: 177).

There are two observations arising from these data. The first is that the effect of clustering within schools is less than in surveys based on samples of intact classes because the effect of clustering within classes is removed. The second is that compared with PISA the clustering is less possibly because ICT Literacy may be less differentiated among schools than is mathematics. The lower values of the intra-class correlation coefficients for the ICT Literacy survey combined with the smaller cluster size to produce relatively small design effects.

Designed Sample

Table 3.2 shows the population of schools and students (net of schools excluded from the target population) and the planned sample.

Table 3.2 Year 6 and 10 Target Population and Designed Samples by State and Territory

	Year 6				Year 10			
	Population		Designed Sample		Population		Designed Sample	
	Schools	Students	Schools	Students	Schools	Students	Schools	Students
NSW	1971	79407	41	597	594	58476	41	600
VIC	1537	57257	41	598	383	39676	40	600
QLD	1041	46302	41	597	315	34310	40	600
SA	516	16945	42	606	160	14509	41	600
WA	657	23819	41	598	184	19650	41	600
TAS	194	5797	31	448	69	4771	30	450
NT	55	1784	16	235	21	1897	15	225
ACT	90	4004	16	233	33	4678	15	225

Sampling Process

First sampling stage

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

The number of students at the target year (the measure of size, or MOS) was accumulated from school to school and the running total was listed next to each school. The total cumulative MOS was a measure of the size of the population of sampling elements. Dividing this figure by the number of schools to be sampled gives the sampling interval.

The first school was sampled by choosing a random number between 1 and the sampling interval. The school, whose cumulative MOS contained the random number was the first sampled school. By adding the sampling interval to the random number, a second school was identified. This process of consistently adding the sampling interval to the previous selection number resulted in a PPS sample of the required size.

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 excluded from the target population included non-mainstream schools (such as schools for students with intellectual disabilities or hospital schools), schools with fewer than five students in the target year levels and very remote schools. These exclusions account for 1.8 per cent of the Year 6 population and 0.8 per cent of the Year 10 population.

Replacement schools

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

After the school sample was drawn, a number of sampled schools were identified as meeting the criteria for exclusion. When this occurred, the sampled school and its replacements were removed from the sample and removed from the calculation of participation rates. Five schools were removed from the Year 6 sample and one school from the Year 10 sample. These exclusions account for less than 0.05 per cent of the student populations and so do not alter the exclusion rates quoted above.

Table 3.3 contains information about school exclusions, refusals and participation. The Year 6 Australian school participation rate was 99% including replacement schools. Excluding replacement schools, the school participation rate was 91%. At Year 10, the Australian school participation rate was 96% including replacement schools. Excluding replacement schools, the school participation rate was 93%.

Table 3.3 Numbers and percentages of participating schools by State and Territory

	Sample	Excluded Schools	Eligible Schools	Participating Schools - Sampled Schools	Participating Schools - Replacement Schools	Non - Participating Schools (Refusals)	Total Number of Participating Schools	School Participation Rate1
Year 6								
NSW	41	*0*	41	*37*	*1*	*3*	38	93%
VIC	41	*0*	41	*40*	*0*	*1*	40	98%
QLD	41	*0*	41	*39*	*2*	*0*	41	100%
SA	42	*1*	41	*41*	*0*	*0*	41	100%
WA	41	*0*	41	*41*	*0*	*0*	41	100%
TAS	31	*0*	31	*31*	*0*	*0*	31	100%
NT	16	*0*	16	*14*	*2*	*0*	16	100%
ACT	16	*0*	16	*10*	*6*	*0*	16	100%
Aust	269	1	268	253	11	4	264	98%
Year 10								
NSW	41	*0*	41	*35*	*4*	*2*	39	95%
VIC	40	*0*	40	*39*	*0*	*1*	39	98%
QLD	40	*0*	40	*35*	*4*	*1*	39	98%
SA	41	*1*	40	*40*	*0*	*0*	40	100%
WA	41	*0*	41	*38*	*2*	*1*	40	98%
TAS	30	*0*	30	*30*	*0*	*0*	30	100%
NT	15	*0*	15	*11*	*0*	*4*	11	73%
ACT	15	*0*	15	*13*	*2*	*0*	15	100%
Aust	263	1	262	241	12	9	253	97%

1 Percentage of eligible (non-excluded) schools in the final sample. Participating replacement schools are included.

Second sampling stage

The second stage of sampling involved using a random sampling technique to select individual students from the target Year level within the sampled school. In most cases, 15 students were sampled from a list of the population of students from the Year level provided by each sampled school. In most schools a further three replacement students were randomly selected to provide for unavoidable absenteeism on the assessment date. Where fewer than 15 students were available at the target level, all students were automatically selected. Where more than 15 students existed, students were sampled with equal probability of selection.

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.

Due to the nature of the ICTL assessment some school principals exercised a prerogative to exclude students selected in the Stage 2 process who qualified for exclusion from the original sample. As ACER received advice, replacements were drawn from the remaining cohort group to maximise participation rates in the study. The data in Table 3.4 represent a post-hoc survey that details the number of students excluded or absent from the National Assessment Program - Information and Communications Technology Literacy assessment (NAP-ICTL), according to the reason given for their non participation. The number of student-level absences that were replaced at the time of the administration of the assessment from the replacement sample was 91 at Year 6 and 149 at Year 10. The final reported exclusion rate (combining school and student exclusions) was 1.1 per cent at Year 6 and 1.0 per cent at Year 10.

Table 3.4 Student exclusions and refusals according to reason by State and Territory

	Number excluded	Number refusing	Total number	Per cent excluded or refused	Number absent (replaced)	Per cent absent %
Year 6						
New South Wales	9	4	13	2.2%	23	3.9%
Victoria	0	0	0	0.0%	0	0.0%
Queensland	10	2	12	2.0%	31	5.2%
South Australia	0	0	0	0.0%	3	0.5%
Western Australia	0	0	0	0.0%	3	0.5%
Tasmania	1	0	1	0.2%	13	2.9%
Northern Territory	14	1	15	6.4%	3	1.3%
Australian Capital Territory	0	2	2	0.9%	15	6.4%
Australia	34	9	43	1.1%	91	1.9%
Year 10						
New South Wales	4	6	10	1.7%	49	8.2%
Victoria	0	0	0	0.0%	1	0.2%
Queensland	2	8	10	1.7%	48	8.0%
South Australia	3	7	10	1.7%	9	1.5%
Western Australia	0	2	2	0.3%	5	0.8%
Tasmania	1	0	1	0.2%	12	2.7%
Northern Territory	6	0	6	2.7%	8	3.6%
Australian Capital Territory	0	1	1	0.4%	17	7.6%
Australia	16	24	40	1.0%	149	3.8%

Participation rates

Table 3.5 includes the final participation rates for the states and territories. Of the eligible sampled students, 98 per cent of Year 6 students and 97 per cent of Year 10 students completed the assessment. Combining the school and student participation rates, the National Information and Communications Technology Literacy Sample Assessment achieved a participation rate of 98 per cent at Year 6 and 96 per cent at Year 10. The table provides information about absentees and participation, including the final student, and combined school and student, participation rates for the states and territories.

Table 3.5 Student numbers and percentages of participating students by State and Territory

	Number of sampled students in original sampled schools	Number of sampled students in participating schools	Number of Eligible students [1]	Number of Absentees (including parental refusal[2])	Number of Participating students	Student Participation Rate[1]	Combined School and Student Participation Rate
Year 6							
NSW	597	552	552	*18*	534	89%	97%
VIC	598	583	583	*8*	575	96%	99%
QLD	597	597	597	*23*	574	96%	96%
SA	606	606	606	*0*	591	98%	98%
WA	598	598	598	*28*	570	95%	95%
TAS	448	448	448	*1*	447	100%	100%
NT	235	220	220	*4*	231	98%	105%
ACT	233	233	233	*9*	224	96%	96%
Australia	3912	3837	3837	91	3746	96%	98%
Year 10							
NSW	600	*590*	590	49	541	90%	92%
VIC	600	*594*	594	1	593	99%	100%
QLD	600	*610*	610	48	562	94%	92%
SA	600	*590*	590	9	581	97%	98%
WA	600	*562*	562	5	557	93%	99%
TAS	450	*440*	440	12	428	95%	97%
NT	225	*170*	170	8	162	72%	95%
ACT	225	*220*	220	17	203	90%	92%
Australia	3900	3776	3776	149	3627	93%	96%

1 Excluded students replaced by principal on assessment day from list of randomly selected students.
2 Parental refusals make up 1.9% of absentees overall. State and territory rates range from 0% - 6%.

Weighting

There are several reasons why the survey weights are not the same for all students.

- The school sample design intentionally over-sampled certain sectors of the school population so that they could be effectively analysed separately.
- Information about school size available at the time of sampling was not always accurate and selection probabilities needed to be computed on the basis of accurate measures of size.

- School non-response, where no replacement school participated, may have occurred, leading to the under-representation of students from that kind of school, unless weighting adjustments were made.

- Student non-response, within participating schools, occurred to varying extents. Students of the kind that could not be given achievement test scores (but were not excluded for linguistic or disability reasons) will be under-represented in the data unless weighting adjustments are made.

In NAP-ICTL05 analyses that are used to make population inferences a weighting procedure was used. Weighting adjusts for intended design differences in the sampling ratios and for differential participation or non-response. In the sampling process the list of schools was explicitly stratified by location and sector and implicitly listed in postcode order. The number of schools from each of the mainland States and Territories was similar so as to ensure a similar level of precision in the estimates derived from those samples. The percentage of schools selected from within Tasmania, the Northern Territory and the Australian Capital Territory was greater than would have been expected on a proportionate basis so as to improve the precision of the estimates for those jurisdictions. 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 an acceptable 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 by the Sampling Interval (SINT) or 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 certain selections into the sample.)

The sampling interval is calculated at the time of sampling, and for each explicit stratum 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 (Np)
2. The number of schools that were sampled but should have been excluded (Nx)
3. The number of non-responding schools (Nn)

Note that Np+Nx+Nn equals the total number of sampled schools from the stratum.

Examples of the second class (Nx) are:

- a sampled school that no longer existed

- a school that following sampling was discovered to have fitted one of the criteria for school level exclusion (eg very remote, very small), but which had not been removed from the frame prior to sampling.

In the case of a non-responding school (Nn), 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:

(Np + Nn) / Np.

The first stage weight is the product of SINT/MOS and (Np + Nn) / Np.

W1 = SINT/MOS * [(Np + Nn) / Np].

The Second Stage Weight

The first factor in the second stage weight is the inverse of the probability of selection of the student from the sampled school. It was calculated as St/Ss, where St is the total number of students in the relevant Year level at the school, and Ss is the number of sampled students.

The second factor is the allowance for non-response. Following data collection, counts of the following categories of students:

- The number of students from the sampled school that participated in the sample (Sp)
- The number of students from the sampled school that were exclusions (Sx)
- The number of students from the sampled school that did not participate (Sn)

Note that Sp+Sx+Sn = St (the total number of students from the sampled school).

The student level non response adjustment was calculated as (Sp+Sn)/Sp.

W3 = St/Ss * (Sp+Sn)/Sp

Overall Sampling Weight

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

FW = W1 * W2

Table 3.6 Numbers of Students and Schools in the Achieved Sample

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

Characteristics of the Achieved Sample

The total achieved sample for the survey consisted of 7,373 students of which 3,746 were from Year 6 and 3,627 were from Year 10. Table 3.6 records the distribution of the sample across the States and Territories for each Year level.

Table 3.7 records the distribution of social and demographic characteristics in the weighted sample. Table 3.7 also shows that there were few missing data on any of the characteristics. There were missing data for parental occupation from four per cent of respondents, for Indigenous status of two per cent of respondents, for geographic location of two per cent of respondents, for language background of one per cent of respondents and very few for sex.

Table 3.7 Distribution of Weighted Sample Characteristics

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

Calculating the precision of estimates

For any survey there is a level of uncertainty regarding the extent to which an estimate measured from the sample of students is the same as the true value of the parameter for the population. An estimate derived from a sample is subject to uncertainty because the sample may not reflect the population precisely. If a statistic was estimated from different samples drawn from the same population of students the observed values for the statistic would vary from sample to sample. The extent to which this variation exists is expressed as the confidence interval. The 95 per cent confidence interval is the range within which the estimate of the statistic based on repeated sampling would be expected to fall for 95 of 100 samples drawn. The difference between two estimates is considered statistically significant at the five per cent level if the confidence intervals of those estimates do not overlap.

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

The survey sample design in this study involves clustering, stratification, and disproportionate allocation which means that it is not appropriate to use the estimates of confidence intervals through standard software procedures because these generally assume a simple random sample and will therefore underestimate the real confidence intervals. The estimates of confidence intervals in this report are based on 'Jacknife' replication methods. In replication methods a series of sub-samples is derived from the full sample, and the statistic of interest is generated for each sub-sample (OECD, 2005: 174 – 184). The variance is then estimated by calculating the variability in the estimate between these sub samples. This technique generates an estimate of the standard error of the estimate and the confidence interval is 1.96 times the standard error.

Structural differences in State and Territory education systems

The sample, while designed to be representative of the student population, incorporates some structural differences that must be kept in mind when interpreting the results of the National Assessment in ICT Literacy. One important feature of the sample is that it is based on Year levels in order to be consistent with the reporting of literacy and numeracy performance in the National Assessment Program. However, due to differences in school starting age, the length of time students have spent in formal schooling varies between the States and territories. Table 3.8 shows the effect that the structural difference in Australian state and territory education systems have on the ages of students in the target populations.

Table 3.8 Average age at assessment and average time at school, by State and Territory

	Year 6		Year 10	
	Average age at assessment	Average time at school	Average age at assessment	Average time at school
New South Wales	12 yrs 0mths	5yrs 11mths	16 yrs 0mths	9yrs 11mths
Victoria	12yrs 1mths	6yrs 9mths	16yrs 1mths	10yrs 9mths
Queensland	11yrs 6mths	5yrs 10mths	15yrs 6mths	9yrs 10mths
South Australia	11yrs 11mths	6yrs 8mths	15yrs 10mths	10yrs 7mths
Western Australia	11yrs 5mths	5yrs 10mths	15yrs 5mths	9yrs 10mths
Tasmania	12yrs 2mths	6yrs 9mths	16yrs 2mths	10yrs 9mths
Northern Territory	11yrs 10mths	6yrs 5mths	15yrs 9mths	10yrs 4mths
Australian Capital Territory	12 yrs 0mths	6 yrs 8mths	16 yrs 0mths	10 yrs 8mths

Table 3.8 shows that there is 10 month difference in average age at testing between students in Western Australia (the 'youngest' state) and students in Tasmania (the 'oldest' state). Students in Western Australia and Queensland had also experienced almost one year of formal schooling less than students in Victoria and Tasmania.

Summary

NAP-ICTL05 was based a two-stage cluster sample. Schools were selected with a probability proportional to size, and disproportionate sampling ratios among strata, from a national stratified sampling frame. Students were selected as simple random sample of 15 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

Information about the ways data were collected and managed is important for interpreting the results that have been reported. The assessment was computer based and administered on an environment that was uniform for all students on computers that functioned reliably. For both the field trial and the main survey the ICT literacy assessment was administered using sets of six networked laptop computers (five were for students and one was for the test administrator) with all necessary software installed. Test administrators travelled to each school with the networked computers to manage the process.

A field trial was conducted in April 2005. Assessments were obtained from 617 students in 66 schools: 332 Year 6 students (35 schools) and 285 Year 10 students (31 schools). For the main survey, which was conducted from mid-September to mid-November 2005, in each school the assessment process involved five students in each of three sessions. In total there were 21 networks (or mini-labs) taken into schools by trained administrators. At the end of each day the files of student responses were burned to CD-ROMs and despatched to ACER where they were compiled in the data file for assessment and analysis.

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

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 have to be undertaken by the contractor or the school. These are listed in order in Table 4.1 and further described in this chapter.

Contact with schools

The field administration of NAP-ICTL required several approaches to the sampled schools to request or provide information:

- The initial approach to the principals of the sampled schools to inform them of their selection. This included a request to name a School Contact and e-mail address, who would coordinate the assessment in the school (using the *Facsimile Response Form*).
    - If the sampled school declined to take part (even with encouragement from an education authority Liaison Officer), the replacement school had to be contacted.
- School Contacts were sent the *School Contact's Manual* and requested, by email, to supply a list of all students in the target cohort (excel template provided). They were requested to send a list of all of the students in those classes (the *Student Register*) and the school's preferred dates for testing (on the *Date Selection Form*).
- School Contacts were sent the list of the fifteen students (three sessions of five students) plus three potential replacement student names to be implemented in the event of casual absenteeism in order to maximise students participation rates. Students were specifically assigned to session times on the arranged assessment date.

Table 4.1 Procedures for field administration

Contractor Activity	School Activity
Contact sampled schools.	
	Complete the *Facsimile Response Form* including the Year 6/10 Cohort List.
	Advise school contact
Sample fifteen students (3 sessions of 5 students plus 3 replacements [1])	
Notify schools of the selected students and provide them with the *School Contact's Manual* and blank copies of the *Student Participation form.*	
	Notify contractor of any excluded students.
	Advise the preferred assessment date.
Sample and supply replacements for excluded students.	
Appoint Test Administrators Send the *Assessment Administrator's Manual* to schools.	
Test Administrators make contact with assigned schools and make individual arrangements with school contact person	Make arrangements for the assessment: ▪ Organise an assessment room ▪ Notify students and parents
Train Test Administrators.	
Conduct the assessment according to the *Assessment Administrator's Manual.* Send National Sample Assessment Monitors to 5% of schools to observe the conduct of the assessment.	Provide suitable venue and ensure sampled students are available at session times.
	Record participation status on the *Student Participation Forms*; complete the *Assessment Administration Form*.
Return the assessment materials to the contractor via CD. Backup assessment results on master CD Backup assessment on administrator pc.	
Marking	
Data Entry	
Data Cleaning	
Create and send *School Reports* to the schools.	

- Copies of the *Assessment Administrator's Manual*, along with preliminary copies of the *Student Participation Forms* (for checking) were sent to the School Contact, shortly before the assessment date.
- The assessment administrators made personal contact with the school contact at least a week before the scheduled assessment date. The School Contact was responsible for

ensuring that an adequate assessment room was provided for the date of the assessment and for communication with teachers regarding student attendance at the assigned session.

- The final contact with schools was to send them the results for the participating students and to thank them for their participation.

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

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

Information management

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

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

Within-school procedures

The School Contact

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

- Liaise with ACER on any issues relating to the assessment;
- Provide ACER with student names for the cohort classes;
- Schedule the assessment and arrange a space for the session(s);
- Check the *Student Participation Form* from ACER for errors;
- Notify teachers, students, and parents about the assessment according to the school's policies;
- Liaise with the Assessment Administrator;
- Assist the Assessment Administrator as necessary;

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

The Assessment Administrator

ACER appointed a number of Assessment Administrators in each state/jurisdiction to ensure a standardised implementation of the assessment materials. State Liaison officers were helpful in the

nomination of appropriate personnel to conduct the assessment in schools. Typically the test administrators were recently retired teachers or relief teachers. In every case the appropriate Child Protection documentation and procedures were sought to enable the test administrators access to school property and students.

The primary responsibility of the Assessment Administrator was to ensure a standardized liaison with the school and to administer the National Information and Communications Technology Literacy Sample Assessment to the sampled students according to the standardised administration procedures provided in the *Assessment Administrator's Manual*. The Assessment Administrator had also to complete the *Student Participation Form* (to record which students participated and which did not) and the *Assessment Administration Form* (to record the timing of the assessment and any problems or disturbances which occurred).

In addition the Assessment Administrator was required to perform a number of technical activities including the construction of the assessment environment (a local area network) and the saving and backup of all student assessment materials. Following the final session the Assessment Administrator was also required to make a master copy of all the session data on a CD to be returned to ACER and also a backup of all the session responses on the Administrator's pc.

The Assessment Administrator was required to administer the Assessment to the sampled students according to the standardised administration procedures provided in the Assessment Administrator's Manual, including a script which had to be followed.

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

Test administration

The timing of the assessment session was standardised. Both Year 6 and Year 10 students were given a total of 90 minutes. The timing of the student background survey and breaks and administration were more flexible. To ensure that these rules were followed, the Assessment Administrator was required to write the timing of the sessions on the *Assessment Administration Form.* Table 4.2 shows the suggested timing of the assessment session.

Table 4.2 Suggested timing of each assessment session.

Session	Year 6	Year 10
Initial administration: Logging students onto the system, reading the on-line instructions, and establishing electronic contact with each participant	(approx) 5 minutes	(approx) 5 minutes
Part A: General Skills Test	(approx) 15 minutes	(approx) 15 minutes
Part B: assigned Module A	(approx) 25 minutes	(approx) 25 minutes
Student break	(approx) 10 minutes	(approx) 10 minutes
Part C: assigned Module B	(approx) 25 minutes	(approx) 25 minutes
Part D: Background questionnaire	Up to 10 minutes	Up to 10 minutes
Final administration: closing student sessions, completing the Assessment backups and completing the Student Participation Form	(approx) 15 minutes	(approx) 15 minutes

Quality control

Quality control was important to the National ICT Literacy Sample Assessment to minimise systematic error and bias. Strict procedures were set to do with 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 undertaken by ACER rather than letting schools choose their own classes;
- providing detailed manuals;
- standardised procedures implemented by ACER employed Assessment Administrators;
- standardised back-up and data redundancy procedures implemented by the Assessment Administrator at each assessment session;
- requiring the Assessment Administrator to record student participation on the *Student Participation Form* (a check against the presence or absence of data);
- requiring the Assessment Administrator to complete an *Assessment Administration Form* which recorded the timing of the assessment and any problems or disturbances which occurred; and
- asking the School Contact to verify the information on the *Student Participation Form* and the *Assessment Administration Form.*

Marker training and marking procedures

The test administration methodology gave rise to a number of unique features in this assessment program.;

- all the cognitive data and student questionnaire data were collected electronically;
- all the multiple choice responses were marked automatically within the assessment software; and
- all student artefacts were marked electronically using specifically designed ACER on-line marking applications customised for each module type.

All the student artefacts and short answer responses were marked centrally in an on-line environment. Approximately two-thirds of the items were open-ended or artefacts and, this necessitated the use of trained markers.

Marking guides were prepared by the contractor and refined during the trial process. A team of experienced markers was employed and trained by the contractor.

Intense training was provided by the project manager and senior test developer for the first week of marking, referencing actual student written responses in the assessment modules. The training introduced markers to the assessment domain, to some basic tenets of marking open-ended items, and artefacts and worked through key aspects/components of the Score Guide. Since most items were common to Year 6 and Year 10 training was based on a module. Markers were unaware whether the response was from a Year 6 or a Year 10 student. Team discussion was conducted to clarify issues, especially of recognition of ways to consistently apply the score guide to student responses, and modelled as the necessary process for accuracy.

Throughout the marking process markers continued to compare their application of the score codes to individual student responses and sought consistency in their marking through consultation and by moderation within the marking team. The two lead markers undertook check marking and were thus constantly monitoring the reliability of the individual markers and the team as a whole.

Approximately 10 per cent of all student test responses were check marked by lead markers. Throughout the whole marking process advice to individual markers and the whole team about clarification and alteration of marking approaches was provided, by the project manager and senior test developer and by the marking leaders. This advisory process was exercised with a view to improve reliability where it was required.

Data management

Data-entry procedures

There were three parts to the data that were collected: the cognitive assessment data, including student artefacts; the student background survey; and the student participation data (from the *student participation forms*). Construction of the database took place in two stages. First, the cognitive assessment data and the background questionnaire data were collated by student identification number (ID) and generated as a response string referenced by unique student ID. The cognitive assessment data were automatically scored within the application software. Data from the marking of the student artefacts were collected by student ID and appended to the cognitive assessment auto-scored response string. Student participation data were entered subsequently and referenced by student and school ID. This was to facilitate the production of reports to schools before the end of the school year.

In order to reduce the extent of data-cleaning the database was constructed with forced validation of codes according to the codebook. That is, only codes applicable to the item would be allowed to be entered into the database.

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

- inconsistencies between the student participation data and the achievement and background data (such as achievement data being available coded as Year 6 or Year 10 but containing data unique to a mutually exclusive year level and achievement data with non-existent student identification);
- inconsistencies between the marking key and expected response patterns; and
    - inconsistencies within the background data involving country of birth or age as outside the expected range (10 to 13 for Year 6 and 14 to 17 for Year 10).

Coding of the student background survey

The student background survey collected both demographic information and information about opportunities and examples of citizenship participation by students (see Table 4.3). 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 PMRT[9]. These guidelines also determined the way in which these data were prepared for analysis and reporting.

Following data entry, the permanent home address of the students was coded to the MCEETYA *Geographical Location Classification* using the *MCEETYA Geographical Location Index* (Jones, 2004) these were then collapsed to provide three geolocation categories: metropolitan, provincial, and remote

Other transformation rules are reported in Table 4.4.

[9] *Data implementation manual for enrolments for the 2005 and 2006 school years*. Available at: http://www.mceetya.edu.au/public/dm.htm

Table 4.3 Student background data collected

Question	Response Format
Experience and Attitude Data	
Computer Experience How long using computers	Never or hardly ever (1) Less than once a year (2) One to three years (3) Three to five years (4) More than five years (5)
Computer type at: Home School Other	Windows (1) Macintosh (2) Both (3) Other (4) None (5)
Frequency of Computer use: Home School Other	Every day (1) A few times a week (2) Weekly to monthly (3) Less than monthly (4) Never (5)
Computer Use… Word Processing Spreadsheet Educational Programs Programming Download recreational Game playing Graphics Communicating Entertainment Media	Every day (1) A few times a week (2) Weekly to monthly (3) Less than monthly (4) Never (5)
Computer Attitudes… Work Fun Interest Lost track of time	Strongly disagree (1) Disagree (2) Agree (3) Strongly agree (4)
Demographic Data	
Gender	Boy (1) Girl (2)
Date of birth (DOB) (Day)	Free response, 2 digits
Date of birth (DOB) (Month)	Free response, 2 digits
Date of birth (DOB) (Year)	Free response, 4 digits
Indigenous status	No (1) Aboriginal (2) Torres Strait Islander (3) Both Aboriginal AND Torres Strait Islander (4)
Country of birth (3 questions = Student/Mother/Father)	Australia (1) Other (2) - if Other specify
Language other than English at home (3 questions = Student/Mother/Father)	No, English only (1) Yes (2) - if Yes specify.
Parent Occupation (3 questions = Mother/Father)	Managers or Professionals (1) Other managers or associate professionals (2) Skilled trades, clerical or sales (3) Unskilled trades, office and sales (4) Not in paid work for 12 months (8)
Parent's highest level of schooling (2 questions = Mother/Father)	Year 12 or equivalent (1) Year 11 or equivalent (2) Year 10 or equivalent (3) Year 9 or equivalent or below (4)

Missing codes were: Multiple / invalid response (8, 88); Missing - Blank (9, 99)

Table 4.4 Transformation rules used to derive variables used in the public report

Variable	Transformation rule
Geolocation - Student	Derived from MCEETYA Geographical Location Classification: Use 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	Verbatim response.
Indigenous	Coded as Indigenous if response was 'yes' to Aboriginal, OR Torres Strait Islander OR Both.
Country of Birth	Only the student information was used. Classified as 'Australia' or 'Other' according to response.
LBOTE	Coded as LBOTE if response was 'yes' to any of the Student, Mother or Father speaking a language at home. If any of the data was missing then the data from the other questions was used. If all of the data was missing then LBOTE was coded missing.
Parental Occupation	The occupations of both parents were recorded as names of occupations and coded in five categories as: Senior managers & professionals; other managers associate professionals; skilled trades, clerical & sales; unskilled manual, office and sales or not in paid work for 12 months. Where responses were provided for two parents parental occupation was coded as the highest status category (with senior managers and professional representing the highest status). When this was done only 3% (Year 6) and 4% (Year 10) were recorded as missing. Information for those whose parents had not been in paid work for 12 months was not reported separately because of the small numbers involved (3% for Year 6 and 2% for Year 10)
Parental Education	If neither parent had a qualification (either by indicating they did not have a qualification or as a result of missing data) then Parental Education equalled the highest response (of either parent) given to the schooling question. If it was indicated that either parent had a qualification, then Parental Education equalled the highest response (of either parent) given to the qualification question. This resulted in an five value variable: 1: Year 9 or equivalent or below 2: Year 10 or equivalent 3: Year 11 or equivalent 4: Year 12 or equivalent 9: Not stated or unknown Only if parental education data for both parents was missing, would Parental Education be coded as 'Missing'.

School reports

Following data entry and cleaning, reports of student performance were sent to each participating school. As each Year 6 and Year 10 student completed two of the five different year-level hybrid assessment modules, three reports were prepared for each school - one for the GST module and one of each of the other two forms. The student reports provide information about each student's achievement on the particular test form that they completed. These reports contained the following information:

- a description of the properties of a high quality response to each item,

- the maximum possible score for each item,
- the percentage of students in the school who achieved the maximum score for each item,
- the percentage of students in NAP-ICTL who achieved the maximum score on each item, and
- the achievement of each student on each item on the form.

An example of a Year 6 and a Year 10 report and the accompanying explanatory material can be found in Appendix C.

Summary

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 there were substantial logistical issues involved in organising the delivery of equipment to schools and in organising for the administration within schools. It was also 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

Scaling is the process through which the patterns of student response to the tasks was used to develop a continuum of ICT Literacy and thus form the basis for analysing and reporting ICT literacy among Australian students in Year 6 and Year 10. Central to the method used to analyse results on the ICT Literacy assessments is the concept of a continuum extending from low-level rudimentary skills to high-level advanced skills. The responses of more than 7,000 students to 227 possible score points associated with the tasks from the seven assessment modules provide the basis for establishing the ICT literacy scale.

The scaling process used item response modelling (the Rasch model) through which the pattern of student responses (which items and how many items they successfully completed) was analysed to establish the difficulty of each item (based on the proportion of students who successfully complete each item). This process also provided the key to generating a single achievement scale on which the items from each of the different assessment modules could be located. This is feasible because a large number of students completed every possible combination of modules; each student completed three of the seven modules and all students completed the GST. On the basis of the scaled map of item difficulties it was possible to describe proficiency levels that provide a generalised description of the typical ICT achievements that could be expected of students at each level.

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

For scaling ICT Literacy it was necessary to conduct the process in a way that linked the results from Year 6 with those from Year 10. There were many common items between Year 6 and Year 10 and the common items that behaved in a similar way in both Year levels were used to “anchor” the scale. These items are referred to as “link” items and they establish the relative difference between Year 6 and Year 10.

When the items had been calibrated it was possible to use the student responses to these items to measure their ICT Literacy levels Because all the items are calibrated on the same scale it is possible to generate an ICT literacy score that does not depend on which of the modules that the students completed. In addition it is possible to interpret students’ scores in terms of the skills that typify these levels.

The scaling model

Test items were scaled using IRT (Item Response Theory) scaling methodology. With the One-Parameter (Rasch) model (Rasch, 1960) for dichotomous items, the probability of selecting category 1 instead of 0 is modelled as

$$P_i(\theta) = \frac{\exp(\theta_n - \delta_i)}{1 + \exp(\theta_n - \delta_i)}$$

where $P_i(\theta)$ is the probability of person *n* to score 1 on item *i*, θ_n is the estimated ability of person *n* and δ_i the estimated location of item *i* on this dimension. For each item, item responses are modelled as a function of the latent trait θ_n.

In the case of items with more than two (k) categories (as for example with Likert-type items) this model can be generalised to the *Partial Credit Model* (Masters and Wright, 1997)[10], which takes the form of

$$P_{x_i}(\theta) = \frac{\exp(\sum_{j=0}^{x} \theta_n - \delta_i + \tau_{ij})}{1 + \exp(\sum_{j=1}^{k} \theta_n - \delta_i + \tau_{ij})}, \quad x = 0, 1, 2, ..., m_i$$

where $P_{xi}(\theta)$ denotes the probability of person *n* to score *x* on item *i*, θ_n denotes the person's ability, the item parameter δ_i gives the location of the item on the latent continuum and τ_{ij} denotes an additional step parameter.

Assessment of item fit

Extensive analyses were conducted of the field trial data item responses. These analyses included item fit, item discrimination, item difficulty, distractor analysis, mean ability and point-biserial correlations by coding category, item omission rates. In addition analyses were conducted of item by gender interactions and item by State/Territory interactions.

Item fit was assessed using a range of item statistics including in-fit weighted mean squares. The Rasch Unidimensional Measurement Models (RUMM 2020) program (Andrich and Sheridan, 2005) was used to identify misfit and in particular to review Differential Item Functioning (DIF) and observed dependency between items using the Residuals Principal Components Analysis routine available within the program to identify interactions where the correlation statistic was greater than 0.4. This level was considered an unacceptable level of inter-dependence and the items were concatenated to create a single item.

DIF was considered for items which were operationally common between Years 6 and 10 to determine if they should be considered as common or unique within the year level. The posterior labels in Table 5.3 indicate those items that have been treated as not common between Year 6 and Year 10 (eg. GST03g6 and GST03g10 indicate that the item GST03 was implemented to both Year 6 and Year 10 however functioned differentially and was considered as a unique item at each year level for the purpose of item calibration and student ability estimation). Having determined the final composition of the item bank, the ACER Conquest software (Wu, Adams and Wilson, 1997) was used for the estimation of item parameters.

Interaction between Test implementation and Item calibration

The assessment originally had a total of 131 tasks in seven modules (HAMs) of which two, Flag Design (FLAG) and Video Games and Violence (VGV) were unique to Year 6 and Year 10 respectively. This meant that 94 tasks were nominally common to both Year 6 and Year 10.

However the assessment design impacted upon final data collected in the study. The student outcome in the GST module resulted in the auto assignment of modules designed to maximise the randomness of the rotated design. However Year 10 students who scored less than 10 points on the GST were assigned to Flag Design (a non Year 10 module by definition). Hence cases of Year 10 responses to a non Year 10 item were recorded. There were a few instances of misclassification of

[10] An alternative is the Rating Scale Model (RSM) which has the same step parameters for all items in a scale (see Andersen, 1997).

student Year level which also resulted in a few students, later identified as Year 6, being assigned to the Video games and Violence module,

For the purpose of item calibration, the data of any student who had been assigned to the two easiest modules (Photo Album and Flag design) as a result of not achieving the defined benchmark score of 10 marks in the GST module was removed from the calibration set. All other data were included in the final calibration data set. Table 5.1 shows that 13.4% of Year 6 students and 1.4% of Year 10 students did not achieve the cut score to activate the auto random assign feature of the application. These students were allocated the modules "Flag Design" and "Photo Album" by default.

Table 5.1 Percentage of students that achieved the required standard in the GST module of the assessment by Year. *

raw score	Year 6			Year 10		
	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
0	3	0.1	0.1	3	0.1	0.1
1	9	0.2	0.3	2	0.1	0.1
2	8	0.2	0.5	0	0.0	0.1
3	9	0.2	0.8	1	0.0	0.2
4	14	0.4	1.1	2	0.1	0.2
5	40	1.1	2.2	0	0.0	0.2
6	44	1.2	3.4	2	0.1	0.3
7	45	1.2	4.6	3	0.1	0.4
8	64	1.7	6.3	4	0.1	0.5
9	89	2.4	8.7	12	0.3	0.8
10	72	1.9	10.6	16	0.4	1.2
11	105	2.8	13.4	7	0.2	1.4
12	134	3.6	17.0	12	0.3	1.8
13	165	4.4	21.4	21	0.6	2.3
14	171	4.6	25.9	41	1.1	3.5
15	252	6.7	32.7	53	1.5	4.9
16	302	8.1	40.7	77	2.1	7.1
17	334	8.9	49.7	114	3.1	10.2
18	352	9.4	59.0	180	5.0	15.2
19	389	10.4	69.4	258	7.1	22.3
20	351	9.4	78.8	379	10.4	32.7
21	321	8.6	87.4	443	12.2	44.9
22	231	6.2	93.5	586	16.2	61.1
23	148	4.0	97.5	615	17.0	78.1
24	67	1.8	99.3	510	14.1	92.1
25	27	0.7	100.0	286	7.9	100.0
Total	3746	100.0		3627	100.0	

** Table reflects all items attempted in the assessment prior to analysis*

Table 5.2 Common test items in Year 6 and Year 10

Item Label (yr 6)	Yr 6 Location	SE	Item Label (yr 10)	Yr 10 Location	SE
GST01	-3.24	0.13	GST01	-3.25	0.22
GST04	-0.65	0.07	GST04	-1.25	0.10
GST09	-1.19	0.07	GST09	-1.40	0.11
GST06	-0.89	0.07	GST06	-1.39	0.11
GST10	-2.09	0.09	GST10	-2.20	0.15
GST11	1.52	0.08	GST11	1.16	0.07
GST15	0.69	0.07	GST15	0.25	0.07
GST18	0.18	0.07	GST18	-0.44	0.08
GST19	-2.18	0.09	GST19	-2.59	0.17
GST28	-1.73	0.08	GST28	-2.22	0.15
GST29	-2.19	0.09	GST29	-2.70	0.18
GST30	-2.95	0.12	GST30	-2.69	0.18
GST21	-1.16	0.07	GST21	-1.17	0.10
GST23	0.79	0.07	GST23	0.76	0.07
COP02	-2.50	0.21	COP02	-2.46	0.27
COP03	2.28	0.16	COP03	1.90	0.11
COP05	0.70	0.12	COP05	0.49	0.11
COP06	2.65	0.18	COP06	1.95	0.11
COP08	2.47	0.18	COP08	2.17	0.11
COP09	3.26	0.23	COP09	2.96	0.13
COP10	2.36	0.17	COP10	2.11	0.11
DVD02	2.66	0.18	DVD02	2.70	0.13
DVD06	5.00	0.48	DVD06	4.40	0.21
DVD11	1.76	0.14	DVD11	1.70	0.11
DVD12	-0.64	0.12	DVD12	-0.78	0.15
DVD26	2.61	0.17	DVD26	1.84	0.11
HDK01	0.97	0.12	HDK01	0.86	0.11
HDK05	1.08	0.12	HDK05	1.08	0.11
HDK13	-0.86	0.12	HDK13	-1.34	0.18
HDK17	0.35	0.11	HDK17	0.23	0.12
PHA11	-1.71	0.14	PHA11	-1.88	0.21
PHA12	-2.05	0.16	PHA12	-2.51	0.27
PHA13	0.37	0.11	PHA13	-0.26	0.13
PHA25	-0.26	0.12	PHA25	-0.65	0.15
PHA26	0.49	0.12	PHA26	0.04	0.13

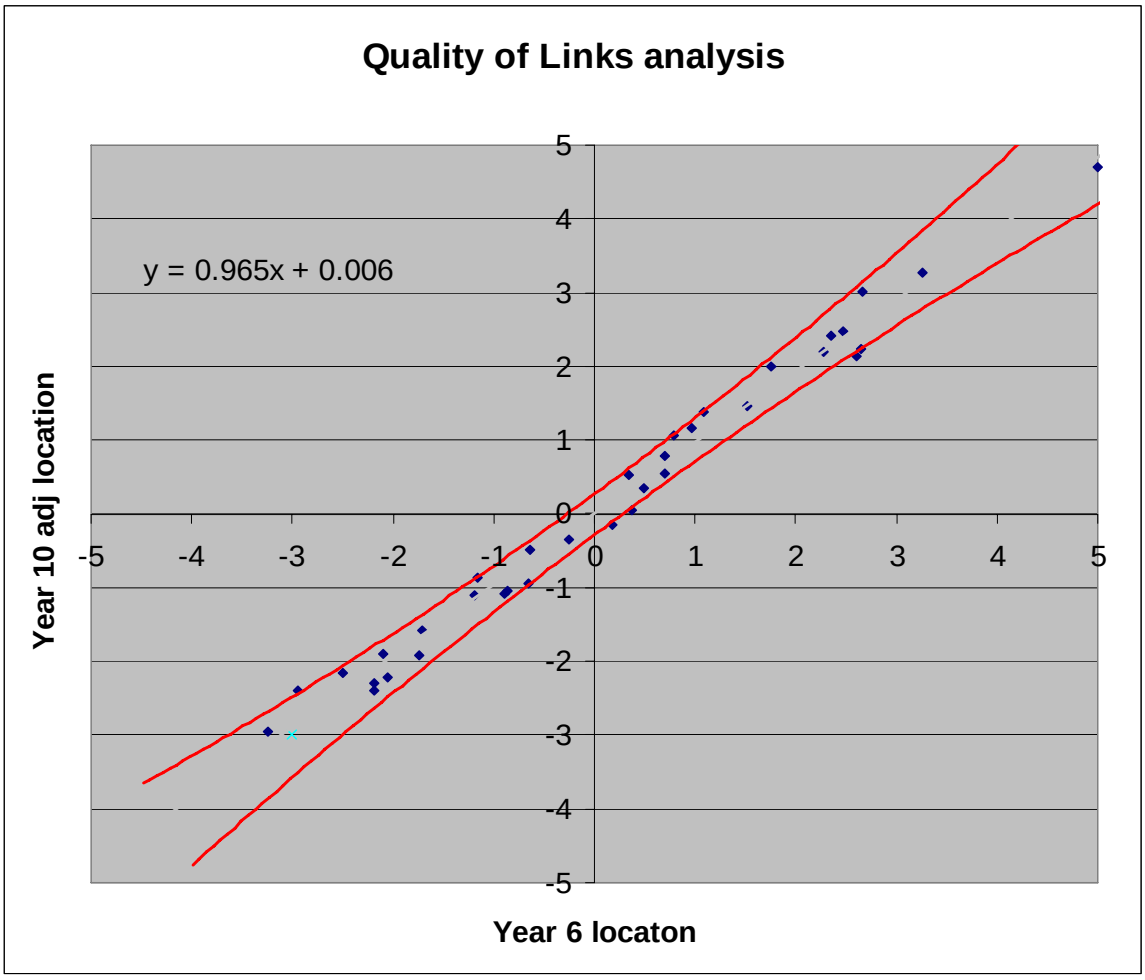

Figure 5.1 Common test items: Analysis of Quality of Links

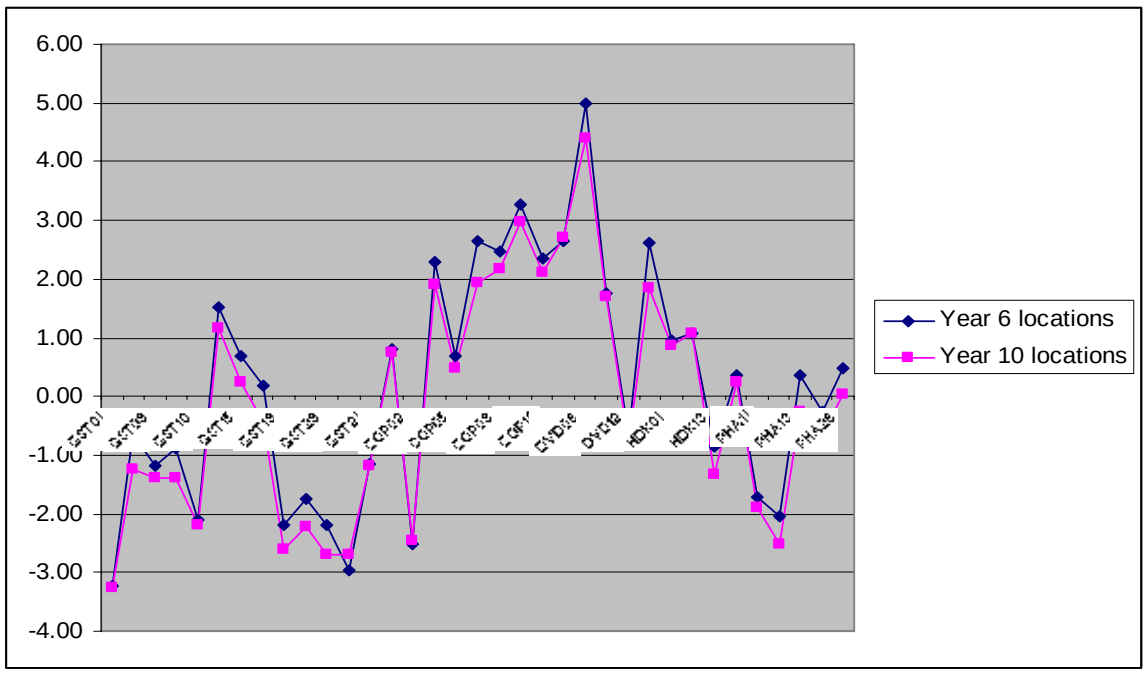

Figure 5.2 Common test items: relative difficulty of common items

Equating

There were many tasks that were presented to students in both Year 6 and Year 10. In fact 93 tasks were presented to both Year levels, 27 were presented only to Year 6 and 43 were presented only to Year 10. Of course these numbers do not show the number of score points recorded because the larger tasks typically involved more than one score point. Some 64 score points were considered as candidates for being treated as common because they had a similar location when considered as part of the Year 6 and the Year 10 test administration. For the purpose of final estimation of item parameters for Year 6 and Year 10 students a set of 35 common items was considered as links. Table 5.2 shows the items finally considered as common links for each of the year levels. Figure 5.1 provides a scatter plot of the relative location of each item bounded by the confidence interval of the sum of the standard errors.

In order to place item locations and student ability estimates for ICL Literacy on the same scale, the items for both year levels were scaled together using concurrent analysis. To validate equating based on common items, it was necessary to review the relative difficulty of common items in each year separately. Figure 5.2 shows the plot between the item parameter estimates based on separate calibrations (the sub-sets of items were standardised to sum for each year level sample to 0) for the 35 common link items.

Common items not used for equating were included in the scaling with re-estimated item parameters, that is, they were treated as if they were unique items to each year level. A total of four items were deleted for one or other or both year levels (GST02g6, GST05g6, DVD06, DVD07) as they were considered to have functioned poorly. Two items (DVD19 and DVD20) were collapsed to form one polytomous item as the dependency between the items indicated that they were not functioning independently. Subsequently this combined item was collapsed to be considered as a dichotomous item.

Item calibration

Item parameters were obtained from all data from the study. This methodology was chosen to maximise the number of cases for each item. The randomised rotated design for the assignment of modules negated any random sampling of students as this would negatively impact on the representation of interactions of students in relation to individual items.

Missing student responses that were likely to be due to problems with test length ("not reached items") were omitted from the calibration of item parameters but were treated as incorrect for the scaling of student responses. "Not reached items" were defined as all consecutive missing values starting from the end of the test except the first missing value of the missing series, which was coded as ‘missing’.

Table 5.2 shows the item parameters and their respective percentage correct for each year sample.

Table 5.2 Item parameters and percentage correct for each year level.

ITEM USE		LINK ITEMS			YEAR 6 ITEMS			YEAR 10 ITEMS		
Module	Item	Difficulty	% Yr 6	% Yr 10	Item	Difficulty	% Yr 6	Item	Difficulty	% Yr 10
GENERAL SKILLS TEST	GST01	-3.516	94%	98%	GST03g6	-2.695	87%	GST02g10	0.570	64%
	GST04	-1.031	62%	89%	GST07g6	2.555	8%	GST03g10	-2.313	95%
	GST09	-1.414	71%	90%	GST08g6	-2.750	88%	GST05g10	-0.727	84%
	GST06	-1.242	67%	90%	GST12g6	-2.563	86%	GST07g10	2.047	34%
	GST10	-2.375	84%	95%	GST13g6	-3.648	94%	GST08g10	-2.219	95%
	GST11	1.156	22%	53%	GST16g6	-0.891	60%	GST12g10	-1.586	92%
	GST15	0.328	36%	69%	GST27g6	-2.164	81%	GST13g10	-2.859	97%
	GST18	-0.250	46%	80%	GST31g6	-0.391	51%	GST16g10	-0.109	76%
	GST19	-2.344	83%	95%	GST26g6	-2.641	84%	GST27g10	-3.000	97%
	GST28	-2.078	79%	95%				GST31g10	-0.094	75%
	GST29	-2.477	83%	97%				GST26g10	-3.070	97%
	GST30	-3.008	89%	97%						
	GST21	-1.414	71%	89%						
	GST23	0.578	33%	62%						
CONSERVATION PROJECT	COP02	-2.688	91%	97%	COP01g6	1.367	22%	COP01g10	2.008	36%
	COP03	1.969	14%	37%	COP04g6	-1.063	70%	COP04g10	-0.672	84%
	COP05	0.453	41%	65%	COP11g6.1	0.234	29%	COP11g10.1	-0.023	41%
	COP06	2.063	11%	36%	COP11g6.2	1.766	8%	COP11g10.2	1.922	20%
	COP08	2.188	11%	31%	COP11g6.3	2.879	2%	COP11g10.3	2.969	11%
	COP09	3.063	5%	18%	COP12g6.1	1.063	22%	COP12g10.1	0.891	46%
	COP10	2.156	11%	32%	COP12g6.2	3.633	2%	COP12g10.2	3.531	9%
					COP13g6.1	1.180	16%	COP13g10.1	1.023	31%
					COP13g6.2	2.336	5%	COP13g10.2	2.398	22%
					COP14g6.1	0.039	36%	COP14g10.1	-0.031	40%
					COP14g6.2	2.266	5%	COP14g10.2	1.914	27%
					COP14g6.3	3.375	1%	COP14g10.3	3.891	5%
DVD DAY	DVD02	2.586	12%	23%	DVD01g6	0.297	44%	DVD01g10	-0.18	77%
	DVD11	1.609	21%	42%	DVD04g6	-2.07	85%	DVD04g10	-1.117	89%
	DVD12	-0.844	66%	87%	DVD05g6	-0.461	59%	DVD05g10	0.047	75%
	DVD26	1.953	14%	38%	DVD10g6	-2.398	89%	DVD10g10	-2.188	96%
					DVD16g6	-1.586	79%	DVD16g10	-2.609	97%
					DVD17g6	-0.195	53%	DVD17g10	-0.492	82%
					DVD18g6	1.883	17%	DVD18g10	1.172	52%
					DVD19_20g6	-0.406	60%	DVD19_20g10	-0.625	85%
					DVD21g6	1.102	27%	DVD21g10	1.047	55%
					DVD25g6	2.211	13%	DVD22g10	-0.07	76%
					DVD29g6.1	-2.156	60%	DVD25g10	1.523	45%
					DVD29g6.2	1.344	21%	DVD29g10.1	-1.719	41%
								DVD29g10.2	1.195	49%

Table 5.2 Item parameters and percentage correct for each year level. (cont)

ITEM USE		LINK ITEMS			YEAR 6 ITEMS			YEAR 10 ITEMS		
Module	Item	Difficulty	% Yr 6	% Yr 10	Item	Difficulty	% Yr 6	Item	Difficulty	% Yr 10
FLAG DESIGN (Year 6 only)					FLD01	-1.305	64%			
					FLD02	-1.016	61%			
					FLD04	-1.234	64%			
					FLD05	-1.563	67%			
					FLD06	0.375	31%			
					FLD11	0.141	38%			
					FLD12	-2.539	85%			
					FLD13	-2.664	86%			
					FLD14	-3.188	90%			
					FLD15	-2.617	85%			
					FLD16	0.430	31%			
					FLD28	-0.664	51%			
					FLD29	-1.398	66%			
					FLD17.1	-2.297	24%			
					FLD17.2	-0.883	45%			
					FLD17.3	1.078	20%			
					FLD18.1	-1.906	37%			
					FLD18.2	-0.117	47%			
					FLD19.1	-2.352	43%			
					FLD19.2	-0.008	46%			
					FLD20.1	-2.867	18%			
					FLD20.2	-1.426	36%			
					FLD20.3	-0.035	40%			
					FLD21.1	-2.219	49%			
					FLD21.2	0.281	25%			
					FLD21.3	1.332	13%			
					FLD22	-1.961	75%			
					FLD23	-0.438	40%			
					FLD24	0.242	27%			
					FLD25	-0.570	43%			

Table 5.2 Item parameters and percentage correct for each year level. (cont)

ITEM USE		LINK ITEMS			YEAR 6 ITEMS			YEAR 10 ITEMS		
Module	Item	Difficulty	% Yr 6	% Yr 10	Item	Difficulty	% Yr 6	Item	Difficulty	% Yr 10
PHOTO ALBUM	PHA11	-1.969	75%	91%	PHA01g6	0.195	34%	PHA01g10	0.055	72%
	PHA12	-2.422	75%	95%	PHA02g6	-2.352	78%	PHA02g10	-2.625	95%
	PHA13	-0.273	45%	79%	PHA03g6	2.57	6%	PHA03g10	1.758	39%
	PHA25	-0.617	41%	69%	PHA28g6.1	-1.805	34%	PHA28g10.1	-1.508	19%
	PHA26	0.164	30%	58%	PHA28g6.2	-0.203	33%	PHA28g10.2	0.141	51%
					PHA28g6.3	1.734	9%	PHA28g10.3	2.484	24%
					PHA09g6	-0.422	50%	PHA09g10	-0.906	85%
					PHA10g6	-0.742	54%	PHA10g10	-1.086	86%
					PHA14g6	1.789	12%	PHA14g10	1.289	48%
					PHA17g6.1	-0.578	36%	PHA17g10.1	0.063	31%
					PHA17g6.2	0.941	13%	PHA17g10.2	1.344	28%
					PHA17g6.3	2.125	4%	PHA17g10.3	2.508	19%
					PHA18g6.1	-0.742	28%	PHA18g10.1	-0.109	19%
					PHA18g6.2	0.309	22%	PHA18g10.2	0.766	36%
					PHA18g6.3	1.961	6%	PHA18g10.3	2.168	27%
					PHA19g6.1	0.078	25%	PHA19g10.1	0.398	35%
					PHA19g6.2	1.438	11%	PHA19g10.2	1.781	36%
					PHA20g6.1	0.273	22%	PHA20g10.1	0.633	32%
					PHA20g6.2	1.316	9%	PHA20g10.2	1.816	24%
					PHA20g6.3	2.594	2%	PHA20g10.3	3.117	10%
					PHA21g6.1	0.492	21%	PHA21g10.1	1.078	31%
					PHA21g6.2	1.563	8%	PHA21g10.2	2.188	24%
					PHA21g6.3	2.348	0%	PHA21g10.3	3.047	0%
					PHA27g6.1	-0.938	28%	PHA27g10.1	-0.211	23%
					PHA27g6.2	0.914	15%	PHA27g10.2	1.156	36%

Table 5.2 Item parameters and percentage correct for each year level. (cont)

ITEM USE		LINK ITEMS			YEAR 6 ITEMS			YEAR 10 ITEMS		
Module	Item	Difficulty	% Yr 6	% Yr 10	Item	Difficulty	% Yr 6	Item	Difficulty	% Yr 10
VIDEO GAMES and VIOLENCE (Year 10 only)								VGV02.1	-0.563	41%
								VGV02.2	1.449	46%
								VGV05	1.555	45%
								VGV40.1	-1.281	57%
								VGV40.2	1.938	36%
								VGV21	1.43	47%
								VGV22	1.5	45%
								VGV23	0.023	75%
								VGV25	0.617	64%
								VGV26	1.664	41%
								VGV27	1.797	39%
								VGV41	2.398	27%
								VGV30	2.391	27%
								VGV31.1	0.914	43%
								VGV31.2	2.914	15%
								VGV32.1	-0.074	24%
								VGV32.2	1.094	39%
								VGV32.3	3.266	10%
								VGV33.1	1.477	36%
								VGV33.2	3.828	0%
								VGV34.1	0.742	39%
								VGV34.2	2.578	14%
								VGV34	3.906	3%
								VGV35	2.203	28%
								VGV36.1	1.945	25%
								VGV36.2	3.43	7%
								VGV37.1	0.109	42%
								VGV37.2	2.18	20%
								VGV37.3	3.555	6%
								VGV38	3.969	7%
HELP DESK	HDK01	0.859	35%	57%	HDK09	-0.031	48%	HDK09	-0.031	73%
	HDK05	0.891	36%	55%	HDK10	1.039	32%	HDK10	1.039	54%
	HDK13	-1.242	74%	90%	HDK11	2.258	16%	HDK11	2.258	31%
	HDK17	0.203	45%	72%	HDK12	2.297	20%	HDK12	2.297	30%
					HDK23	-0.234	68%	HDK23	-0.234	75%
					HDK13	-1.242	74%	HDK13	-1.242	90%
					HDK17	0.203	45%	HDK17	0.203	72%
					HDK14	-0.805	63%	HDK14	-0.805	88%
					HDK16	0.328	72%	HDK16	0.328	70%
					HDK21.1	-1.969	38%			
					HDK21.2	-0.008	35%			
					HDK21.3	1.695	13%			
					HDK22.1	-0.680	48%			
					HDK22.2	1.594	16%			

Plausible values

In item response scaling methods student proficiencies are not observed but inferred from the observed item responses. There are several possible alternative approaches for making these inferences. In NAP-ICTL05 an imputation methodology referred to as Plausible Values was used to generate estimates of students' ICT Literacy. Plausible Values are a selection of likely proficiencies for students that attained each score. It is a methodology that is employed in PISA.

In this method item parameters are anchored at their estimated values from the calibration sample and plausible values are random draws from the marginal posterior of the latent distribution (see Mislevy, 1991). Estimations are based on the conditional item response model and the population model, which includes the regression on background variables used for conditioning (see a detailed description in Adams, 2002). The ACER CONQUEST software was used for drawing plausible values.

The student background variables used for conditioning of Year 6 and Year 10 student scores are recorded in Table 5.3. These background variables were used as direct conditioning variables.

Table 5.3 Student background variables used for conditioning

Variable	Label	Coding	Used in Year Level	Direct/ Indirect conditioning variable
SEX	Sex	1 = Boy 2 = Girl 9 = missing	6/10	Direct
ATSI	Aboriginal or Torres Strait Islander	1 = Non ATSI 2 = ATSI 9 = missing	6/10	Direct
PAROCC	Parental occupation combined	1 = or managers and professionals 2=other managers and associate professionals 3 = skilled trades, clerical and sales 4 = unskilled manual, office and sales 8 = not in paid work for 12 months 9 = missing	6/10	Direct
location	geographic location student (three)	1 = metropolitan 2 = provincial 3 = remote 9 = missing	6/10	Direct
Grade	Student final grade level	1 =Year 6 2 = Year 10	6/10	Direct
STATE	Student State / Territory	1 = NSW 2 = Victoria 3 = Queensland 4 = South Australia 5 = Western Australia 6 = Tasmania 7 = Northern Territory 8 = Australian Capital Territory	6/10	Direct
LBOTE	Student final LBOTE status	1= English speaking background 2= Language background other than English 9 = missing	6/10	Direct

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. Finally plausible values were used to impute student scores on the ICT Literacy scale. 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
REPORTING OF RESULTS

The reporting scale for ICT Literacy resulted from a linear transformation of natural logit metrics that resulted from the scaling process outlined in the previous chapter. Consistent with other studies in the National Assessment Program, the results for ICT literacy have been standardised to have a mean score of 400 and a standard deviation of 100 for Year 6 students. The choice of these values means that about two-thirds of the Year 6 students have ICT literacy scores between 300 and 500 points.

Standardisation of student scores

The national item parameters obtained from the calibration samples were used to compute plausible values for each year sample. The person parameters were transformed to the national metric with a mean of 400 and a standard deviation of 100 in the weighted Year 6 sample. The transformation was achieved by applying the formula:

$$\theta'_n = 400 + 100 ((\theta_n - \bar{\theta})/\sigma_\theta),$$

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

Scaled Score Result by State or Territory

Table 6.1 shows the mean scaled score and confidence interval for each State or Territory in the ICT literacy sample. Commentary on the relative performance of states and territories can be found in Chapter 4 of National Assessment program – ICT Literacy Years 6 & 10 report 2005.

Table 6.1 Mean Scaled scores and confidence intervals by State or Territory

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

Notes:
Differences in confidence intervals reflect differences in sample sizes for jurisdictions as well as differences in the variation within jurisdictions.

The larger confidence intervals in the Northern Territory and the Australian Capital Territory reflect the smaller sample sizes for those jurisdictions. For the Northern Territory the effect of the smaller sample size is compounded by the large variation in scores within the jurisdiction.

Estimation of sampling and measurement variance

Student samples were obtained through two-stage cluster sampling procedures: On the first stage schools were sampled from a sampling frame with a probability proportional to their size, on the second stage individual 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 NAP-ICTL 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. Assignment of schools to these so-called 'Sampling Zones' needed 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.

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 253 replicate weights were computed regardless of the number of sampling zones.

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

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

where H is the number of sampling zones, t(S) the statistic t estimated for the population using the original sampling weights, $t(J_h)$ 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 National ICT Literacy Sample Assessment, SPSS macros were used to estimate JRR variance for means and percentages.

Population statistics on 'ICT Literacy' from the NAP-ICTL 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 allows also 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:

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

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 200*5 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 standard error. 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.
- 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. The significance tests include an adjustment for multiple comparisons using a Bonferroni adjustment. This was necessary 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.

Differences between state or territory means were considered as significant when the test statistic t was greater than the critical value. 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.

Summary

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. Consequently about two-thirds of the Year 6 students have ICT literacy scores between 300 and 500 points. It also results in the mean score for Year 10 students being 551 scale points with a standard deviation of 97.5. The reporting scale was used as a basis for comparing States/Territories as well as a other groups of students. 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 *Jacknife* replication methods that take account of clustering in the sampling process as well as other characteristics of the sample.

CHAPTER 7
PROFICIENCY LEVELS AND STANDARDS-SETTING

Although scale scores provide one method of reporting ICT literacy and reporting comparisons of different groups of students, it is also possible to provide a profile of students' ICT literacy in terms of proficiency levels. The scale of ICT literacy was divided into six levels of equal width (i.e. an equal range of student ability/item difficulty on the scale) with information about the items in each level being used to develop descriptions of the ICT literacy associated with each level.

In addition 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. The process for setting standards in areas such as primary science, information and communications technologies, civics and citizenship and secondary (15-year-old) reading, mathematics and science was endorsed by the PMRT at its March 2003 meeting and is described in the PMRT paper, *Setting National Standards*. This process, referred to as the 'empirical judgemental technique', requires stakeholders to examine the test items and the results from the national assessments and agree on a proficient standard for the two year levels.

Proficiency levels

Principles

One of the key objectives of the MCEETYA National Assessment Program is to monitor trends in ICT Literacy over time. One convenient and informative way of describing student performance over time is to reference the results to proficiency levels. Students whose results are located within a particular level of proficiency are typically able to demonstrate the understandings and skills associated with that level, and also typically possess the understandings and skills defined as applying at lower proficiency levels. Defining proficiency levels requires a number of decisions so that they can be used to summarise and report student performance. The scale of 'ICT literacy' is continuous and the use of performance levels, or levels of proficiency, involves an essentially artificial division of that continuous scale into discrete parts. The number of divisions and the location of the cut-points that mark the boundaries of the divisions need to be determined.

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

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

Technical information

To facilitate the reporting of results, several of the technical standards from PISA have been adopted. PISA developed a method that ensured that the notion of 'being at a level' could be

interpreted consistently, given 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. This method is expressed as follows:

- *the expected success of a student at a particular level on a test containing items at that level (proposed to be set at a minimum that is near 50 per cent for the student at the bottom of the level, and higher for other students in the level);*
- *the width of the levels in that scale (determined largely by substantive considerations of the cognitive demands of items at the level and observations of student performance on the items); and*
- *the probability that a student in the middle of a level would correctly answer an item of average difficulty for that level (in fact, the probability that a student at any particular level would get an item at the same level correct), sometimes referred to as the 'RP-value' for the scale (where 'RP' indicates 'response probability').*(OECD, 2005, p.255)

To achieve this for the National ICT Literacy Sample Assessment, the following two of the key mathematically-linked standards were adopted:

- setting the response probability for the analysis of data at p = 0.62; and
- setting the width of the proficiency levels at 1.25 logits.

As a consequence of adopting these standards for the report, the following inferences can be made about students' proficiency in relation to the proficiency levels:

- A student whose result places him/her at the lowest possible point of the proficiency level is likely to get 50 per cent correct on a test made up of items spread uniformly across the level, from the easiest to the most difficult.
- A student whose result places him/her at the lowest possible point of the proficiency level is likely to get 62 per cent correct on a test made up of items similar to the easiest items in the level.
- A student at the top of the proficiency level is likely to get 82 per cent correct on a test made up of items similar to the easiest items in the level.
- A student whose result places him or her at the same point on the ICT Literacy Scale as the cut-point for the Proficient Standard is likely to get 62 per cent correct on a test made up of items similar to the items at the cut-point for the standard.

Clearly it is possible to change the two mathematically interrelated technical standards in order to vary the inferences about the likely percentage correct on tests. The position taken by PISA, and adopted by PMRT, attempts to balance the notions of mastery and 'pass' in a way that is likely to be understood by the community.

Specifying Proficiency Levels

In practice the process of specifying the proficiency levels required some adjustments to be made after the standards setting exercise so that the standards corresponded to a boundary between levels. Six proficiency levels were identified for reporting student performances from the assessment. Table 7.1 identifies these levels by cut-point (in logits and scale score) and gives the percentage of students by year level.

Table 7.1 Proficiency level cut-points and percentage of Year 6 and Year 10 students in each level

	Cut-points		Approximate Percentage of Students in each Proficiency Level	
Proficiency Level	Logits	Scale Scores	Year 6	Year 10
Level 6 and above	3.50	750	0.0	0.4
Level 5	2.25	625	0.1	11.9
Level 4	1.00	500	7.7	48.9
Level 3	-0.25	375	40.8	32.0
Level 2	-1.50	250	38.8	6.4
Level 1 and below	-2.75	125	12.6	0.4

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 are then used to encapsulate ICT literacy of students associated with each level. As a set, the descriptions encapsulate a representation of growth in ICT literacy. Appendix D: *ICT Literacy Progress Map* provides the descriptions of the knowledge and skills required of students at each proficiency level.

Distribution of students across proficiency levels

Table 7.2 records the percentage of students in each of the jurisdictions at or above each proficiency level. They also show in brackets the 95 per cent confidence interval about the mean estimates for each proficiency level. This has been calculated using the formula: 95% confidence interval = 1.96 x standard error.

The percentage of students achieving each proficiency level for each State and Territory are presented in the public report – National Assessment Program – ICT Literacy Years 6 and 10 Report 2005 (Ainley et al,2007).

Table 7.2 Percentages of Year 6 and Year 10 students at or above each proficiency level on the ICT Literacy Scale.

	Proficiency Level					
	Level 1 or above	Level 2 or above	Level 3 or above	Level 4 or above	Level 5 or above	Level 6 or above
Year 6	98.8 (+/- 0.5)	87.4 (+/- 1.6)	48.6 (+/- 3.0)	7.8 (+/- 1.6)	0.1 (+/- 0.1)	0.0 (+/- 0.1)
Year 10	100.0 (+/- 0.0)	99.6 (+/- 0.2)	93.2 (+/- 1.2)	61.2 (+/- 3.1)	12.3 (+/- 1.6)	0.4 (+/- 0.4)

Tables 7.3 and 7.4 show the percentage of groups (such as males and females, Indigenous students etc) achieving at or above each proficiency level. For a discussion of these results and possible statistically significant differences between groups, refer to the *National Assessment Program – ICT Literacy Years 6 and 10 Report 2005*.

Table 7.3 Percentages of Year 6 students at or above each proficiency level on the ICT Literacy Scale, by group.

Year 6	Proficiency Level				
	Level 1 or above	Level 2 or above	Level 3 or above	Level 4 or above	Level 5 or above
Male	98.5 (+/- 0.7)	85.6 (+/- 2.6)	45.4 (+/- 4.9)	7.9 (+/- 2.0)	0.2 (+/- 0.3)
Female	99.0 (+/- 0.7)	89.3 (+/- 2.0)	52.0 (+/- 4.1)	7.8 (+/- 2.0)	0.1 (+/- 0.2)
Indigenous	93.4 (+/- 5.4)	74.8 (+/- 10.6)	29.9 (+/- 12.9)	1.2 (+/- 3.0)	-0.1 (+/- 0.4)
Language other than English spoken at home	98.5 (+/- 1.2)	86.5 (+/- 3.7)	48.8 (+/- 6.2)	8.7 (+/- 2.6)	0.0 (+/- 0.0)
Metropolitan	99.0 (+/- 0.6)	88.8 (+/- 2.0)	51.9 (+/- 3.8)	9.0 (+/- 2.0)	0.2 (+/- 0.2)
Provincial	98.5 (+/- 1.2)	85.8 (+/- 3.2)	42.7 (+/- 5.5)	5.3 (+/- 2.4)	0.1 (+/- 0.2)
Remote	94.2 (+/- 7.7)	73.9 (+/- 15.1)	32.6 (+/- 18.9)	2.5 (+/- 4.2)	0.0 (+/- 0.0)
Australia	98.8 (+/- 0.5)	87.4 (+/- 1.6)	48.6 (+/- 3.0)	7.8 (+/- 1.6)	0.1 (+/- 0.1)

Table 7.4 Percentages of Year 10 students at or above each proficiency level on the Civics and Citizenship Scale, by group.

Year 10	Proficiency Level					
	Level 1 or above	Level 2 or above	Level 3 or above	Level 4 or above	Level 5 or above	Level 6 or above
Male	100.0 (+/- 0.0)	99.7 (+/- 0.3)	91.9 (+/- 1.8)	59.6 (+/- 4.2)	11.6 (+/- 2.3)	0.4 (+/- 0.6)
Female	100.0 (+/- 0.0)	99.6 (+/- 0.4)	94.5 (+/- 1.7)	62.9 (+/- 3.5)	13.2 (+/- 2.3)	0.4 (+/- 0.5)
Indigenous	100.0 (+/- 0.0)	97.3 (+/- 3.9)	79.3 (+/- 10.1)	35.0 (+/- 11.5)	5.8 (+/- 5.8)	0.0 (+/- 0.0)
Language other than English spoken at home	100.0 (+/- 0.0)	99.4 (+/- 0.6)	92.0 (+/- 2.7)	58.6 (+/- 5.6)	12.8 (+/- 3.5)	0.6 (+/- 1.1)
Metropolitan	100.0 (+/- 0.0)	99.6 (+/- 0.3)	93.4 (+/- 1.4)	62.8 (+/- 4.1)	13.6 (+/- 2.3)	0.4 (+/- 0.5)
Provincial	100.0 (+/- 0.0)	99.9 (+/-0.3)	92.8 (+/- 2.9)	58.6 (+/- 5.7)	10.1 (+/- 3.9)	0.4 (+/- 0.9)
Remote	100.0 (+/- 0.0)	96.9 (+/- 5.0)	84.6 (+/- 8.0)	45.8 (+/- 9.7)	6.8 (+/- 5.0)	0.1 (+/- 0.6)
Australia	100.0 (+/- 0.0)	99.6 (+/- 0.2)	93.2 (+/- 1.2)	61.2 (+/- 3.1)	12.3 (+/- 1.6)	0.4 (+/- 0.4)

Standards-setting

The standards setting workshop was conducted over two days. PMRT members were invited to nominate up to two representatives from each jurisdiction ('expert judges') to participate in a standard-setting workshop on 20 & 21 June 2006. The first day was devoted to identifying a Proficient Standard for Year 6 and the second day a Proficient Standard for Year 10. The majority of experts nominated by jurisdictions attended both days. The first few hours of each day were devoted to training to assist participants to identify a standard from the assessment materials.

Methods

The standard setting process first required expert judges to identify and discuss factors, in addition to ICTL skills and understandings that influenced the difficulty of the items. The factors included the literacy and numeracy demands of the items, the number of steps and the number of pieces of relevant information in the question, and the format and complexity of the information provided in the question.

The expert judges were required to decide independently whether a marginally-proficient Year 6 or Year 10 student would be expected to answer each of the questions from the national assessment correctly. The term 'marginally' was added to 'proficient' to focus judges' attention on the lower end of the 'proficient' range, rather than on exemplary performances. Conceptually, this matched with the lower end of the proficiency levels in the report.

Two methods were utilised to identify a standard, establish the proficiency cut-points and triangulate the results. They were a Modified Angoff Method (Angoff, 1971) and the Bookmark Method (Lewis, Mitzel & Green, 1999). In the modified-Angoff Method the experts were presented with each individual assessment item and asked simply to select 'Yes' or 'No' to identify whether they believed that a marginally proficient Year 6 or 10 student (depending on which level was being established) could reasonably be expected to complete the item successfully. These individual expert data were then collated and each expert received a summary data sheet that included their own rating for each item, the percentage of all expert raters who selected 'Yes' and 'No' for each item and the percentage of students in the target year level who successfully completed the item in the national assessment. The experts were then given the opportunity to consider and discuss their judgements.

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

The results from the rating session, which showed the percentage of judges who expected marginally-proficient students to answer each question correctly, were summarised and returned to the judges. The results were rearranged in order of test item difficulty (as calculated from the national assessment) so that judges could see the trends in the data. Judges were also given an information sheet showing the percentage of students that had answered each question correctly in the 2005 testing. This information and the rating information were initially discussed by the whole group.

Judges were then requested to work in groups to identify a question or small group of questions that best represented the most difficult items that a marginally-proficient student could be expected to answer correctly. In coming to a decision, judges were expected to use the national test data, their initial ratings and the summary ratings for the group. The information from judges would locate the base of the 'proficient' level in the draft assessment; that is, the cut-point for the standard.

Each group reported their decision to the rest of the workshop. This was followed by clarification and discussion of the rationale behind each group's decision. From the feedback and discussion it was evident that many of the judges had high expectations of students in Years 6 and 10.

To conclude the standards-setting process, judges were required to identify and record independently the most difficult items that a marginally-proficient student would be expected to answer correctly, and give reasons for their decisions. These results were collated by BEMU and helped inform the standards adopted for the project.

Locating the standard

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

The cut-points for the Proficient Standards were selected by BEMU and ACER after extensive examination and consideration of the data from the standard setting workshop, the students' results from the ICT Literacy Sample Assessment, and close scrutiny outcomes described in the ICT Literacy assessment framework. Triangulation of the location of the proposed cut-points was also undertaken.

Table 7.5 Percentages of Year 6 students and Year 10 at the proficient standard on the ICT Literacy Scale, by state and nationally.

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

As both Year 6 and Year 10 students were scaled together and are presented against the same proficiency levels, the location of the Year 6 standard was set first and the Year 10 standard fell at the cut-point of the proficiency level that fell closest to the cut-point identified through the process previously described.

The cut-point of the Year 6 Proficient Standard was located at -0.25 logits. This defined the lower edge of Proficiency Level 3 in Table 7.1. The Year 10 Proficient Standard is located at 1.00 logits which defines the lower edge of Proficiency Level 4. The Proficient Standards for Year 6 and Year 10 ICT literacy were endorsed by the Key Performance Measures sub-group of the PMRT.

The Proficient Standard for Year 6 agreed to by PMRT was established as equivalent to Level 3. The Year 10 Proficient Standard was established as equivalent to Level 4. Approximately 49 per cent of Year 6 and 61 per cent of Year 10 students achieved the relevant year level Proficient Standards. Some differences between the proportions of students achieving the proficiency standards can be observed across the Australian States and Territories shown in Table 7.5.

Summary

To facilitate reporting the ICT literacy scale was divided into six described proficiency levels. 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. In addition 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 then possible to report the percentages of students at each year level who had attained the standard expected for that year level.

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APPENDICES

APPENDIX A
STUDENT BACKGROUND SURVEY OF ICT LITERACY 2005

(Print Format Version – Almost all students completed an On-Line Version)

Name:

Student ID:

Q1 How long have you been using computers?

(Please tick only one box.)

I have never used a computer. ..... ☐

Less than one year. ..... ☐

One to three years. ..... ☐

Three to five years. ..... ☐

More than five years. ..... ☐

Q2 What type of computers do you use in these places?

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

	Windows {PC)	*Macintosh*	*Both*	*Other*	*None*
a) At home	☐	☐	☐	☐	☐
b) At school	☐	☐	☐	☐	☐
c) At other places	☐	☐	☐	☐	☐

Q3 How <u>often</u> do you use a computer in these places?

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

		Almost every day	*A few times each week*	*Between once a week and once a month*	*Less than once a month*	*Never*
a)	At home.	☐	☐	☐	☐	☐
b)	At school.	☐	☐	☐	☐	☐
c)	At other places.	☐	☐	☐	☐	☐

Q4 How <u>often</u> do you:

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

		Almost every day	*A few times each week*	*Between once a week and once a month*	*Less than once a month*	*Never*
a)	use the Internet to look up information?	☐	☐	☐	☐	☐
b)	do word processing?	☐	☐	☐	☐	☐
c)	use spreadsheets?	☐	☐	☐	☐	☐
d)	use mathematics, language or other learning programs on a computer?	☐	☐	☐	☐	☐
e)	use a computer for programming? ...	☐	☐	☐	☐	☐

Q5 **How <u>often</u> do you:**

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

		Almost every day	*A few times each week*	*Between once a week and once a month*	*Less than once a month*	*Never*
a)	download games or music from the internet?	☐	☐	☐	☐	☐
b)	play games on a computer?	☐	☐	☐	☐	☐
c)	use drawing, painting or graphics programs on a computer?	☐	☐	☐	☐	☐
d)	use a computer for email or "chatting"?	☐	☐	☐	☐	☐
e)	use a computer to listen to music or watch DVDs?	☐	☐	☐	☐	☐

Q6 *Thinking about your experience with computers:* **To what extent do you agree with the following statements?**

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

		Strongly agree	*Agree*	*Disagree*	*Strongly disagree*
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.	☐	☐	☐	☐
d)	I lose track of time when I am working with the computer.	☐	☐	☐	☐

Q 7 Are you a boy or a girl? Boy ☐ Girl ☐

Q8 Where do you live? Please write in below the place name and postcode of your permanent home address.

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

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

Place Name:	Postcode:

Q 9 What is your date of birth?

Day	**Month**	**Year**

Q 10 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 11 In which country were you born?

Australia	Other,	please specify country:
☐	☐	

Q 12 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	☐	☐	☐
Yes	☐	☐	☐

Please specify language

Q 13 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.*

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 14 What is your mother's/female guardian's main job? (e.g., school teacher, cleaner, sales assistant) *If she is not working now, please tell us her last main job.*

If she is not working now, please tell us what she did in her last main job.

Please describe the kind of work she does or did in that job.

15. What are the highest years of primary or secondary school you parents/guardians have completed?

(Draw a circle around one option for each of (a) and (b) to show your answer.)

(a) Your father/male guardian	(b) Your mother/female guardian
Don't know	Don't know
Year 12 or equivalent	Year 12 or equivalent
Year 11 or equivalent	Year 11 or equivalent
Year 10 or equivalent	Year 10 or equivalent
Year 9 or below	Year 9 or below

16. What is the level of the highest qualification your parents/guardians have completed?

(Draw a circle around one option for each of (a) and (b) to show your answer.)

(a) Your father/male guardian	(b) Your mother/female guardian
Don't know	Don't know
Bachelor degree or above	Bachelor degree or above
Advanced diploma/Diploma	Advanced diploma/Diploma
Certificate (including trade certificate)	Certificate (including trade certificate)
No non-school qualification	No non-school qualification

APPENDIX B
ASSESSMENT ADMINISTRATION FORM

Section 1

School:_____

School Contact:_____

Class:_____

Test Administrator:_____

Type of assessment session (please tick): ☐ **Main Session**
☐ **Follow-up Session**

Date:_____ October 2004

Scheduled start time: _____

Section 2

Actual schedule of the testing sessions:

	Start	Finish
Instructions		
Part A		
Break		
Practice Questions		
Part B		

Section 3

Did a National Sample Assessment Observer attend the session?

YES / NO (please circle)

Disruptions: Did any of the following affect the test session?

- Announcements over the loudspeaker/Alarms **YES / NO (please circle)**
- Class Changeover in the school **YES / NO (please circle)**
- Other students not participating in the test session **YES / NO (please circle)**
- Students or teachers visiting the testing room **YES / NO (please circle)**

ICTL STUDENT PARTICIPATION FORM

State/Territory: _____

School Name: _____

SAMPLING INFORMATION			
(A) # Students Year 6 _____	(B) # Classes in Year 6 _____	(C) Estimated Sample Size 15	(D) Actual Sample Size _____

PART A - STUDENT NON PARTICIPANT ~ IDENTIFIED AT TIME OF ADVICE OF THE SAMPLE BY THE PRINCIPAL

(1) ID #	(2) Student Name	(3) Gender F=1; M=2	(4) ATSI Yes = 1 No = 2	(5) Birth Date (MM-YY)	(6) SEN Code	(7) NON Inclusion Code
1						
2						
3						
4						

SPECIAL EDUCATION NEEDS CODES (SEN) (Col 6)	**NON INCLUSION CODES (Col 7)**
0 = No special education needs	10= Absent
1 = Functionally disability	11 = Not included; functional disability
2 = Intellectual disability	12 = Not included; intellectual disability
3 = Limited test language proficiency	13 = Not included; limited test language proficiency
	14 = Student or parent refusal

PART B - STUDENT PARTIAL PARTICIPANT ~ IDENTIFIED ON THE DAY OF THE ASSESSMENT AND REPORTED BY THE TEST ADMINISTRATOR

(1) ID # 	(2) Student Name	Absent for **Module A**	NON INCLUSION Code (Above)	Absent for **Module B**	NON INCLUSION Code (Above)
1					
2					
3					
4					

APPENDIX C
EXAMPLE SCHOOL REPORTS AND EXPLANATORY MATERIAL

APPENDIX C: ICT SCHOOL REPORTS

Ministerial Council on Education, Employment, Training and Youth Affairs

ACER

ICT School Report

School *De-identified Primary School* ***State*** *VIC* ***Year*** *6*

School N 15

Item Set *General Skills* Sample N 3496

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Drag and drop the labels to identify the parts of the computer.	100	94	1
Q02	Drag and drop the labels to identify the parts of the screen.	67	50	1
Q03	Recognise that light grey options on a pull down menu are not able to be selected.	93	87	1
Q04	Drag and drop labels to identify a file location, a URL and an email address.	87	61	1
Q05	Select the best search term for a given topic.	73	78	1
Q06	Add a web page to a list of Favourites (Bookmarks).	60	65	1
Q07	Search for the file named 'Rivers' on the C: Drive	20	8	1
Q08	Drag and drop the document 'English Homework' into the 'English' folder	87	87	1
Q09	Recognise that a school's URL contains the 'edu' suffix.	87	70	1
Q10	Open the 'Crocodile' file from the desktop	80	84	1
Q11	Use the Find function to search for the word 'insect' in this document	7	21	1
Q12	Delete selected text from a document.	93	85	1
Q13	Save the document	93	93	1
Q14	Insert a picture into a document.	20	35	1
Q15	Move the cursor to a specified location in a document.	67	60	1
Q16	Add bullet points to selected text in a document.	27	45	1
Q17	Select 'Page Setup' from the File menu	87	82	1
Q18	Move the cursor to a specified location (cell) in a spreadsheet.	67	70	1
Q19	Activate the Chart Wizard from within a spreadsheet.	80	32	1
Q20	Recognise that the best way to turn off a computer is to use the 'Shut Down' command.	93	84	1
Q21	Select all the text on a webpage.	87	80	1
Q22	Copy the selected text on a webpage.	100	79	1
Q23	Paste text from the clipboard into a document.	93	83	1
Q24	Save a document (Save As).	100	89	1
Q25	Select the best location for a document to be saved in a simple directory tree.	47	49	1
Sample	**Score on Item Set**	**73**	**67**	**25**

Ministerial Council on Education, Employment, Training and Youth Affairs

ACER

ICT School Report

School	*De-Identified Primary School*	***State***	*VIC*	***Year***	*6*
				School N	7
Item Set	*Flag Design*			Sample N	1766

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Identify hyperlink from within an email message	57	63	1
Q02	Navigate around a website to locate simple specified information.	43	62	1
Q03	Recognise correct button on website that leads to desired information	86	64	1
Q04	Recognise correct button on website that leads to desired information	86	67	1
Q05	Use ‘Save Picture As’ function	43	30	1
Q06	Recognise benefits of consistency in webpage structure	29	38	1
Q07	Flag Skills: Select background to match source.	71	85	1
Q08	Flag Skills: Select symbol to match source.	100	86	1
Q09	Flag Skills: Move image to match source.	86	90	1
Q10	Flag Skills: Resize image to match source.	86	87	1
Q11	Flag Skills: Change colour of symbols to match source.	71	30	1
Q12	Flag Design: Demonstrate ability to manipulate design components	62	60	3
Q13	Flag Design: Create an aesthetic balance	86	67	2
Q14	Flag Design: Focus design on key elements	79	68	2
Q15	Flag Design: Demonstrate ability to manipulate design components	67	71	3
Q16	Flag Design: General On Balance Judgement - create a good design	43	34	4
Q17	Recognise etiquette when replying to formal email	0	4	1
Q18	Enter text into 'Subject' box in email	14	40	1
Q19	Attach document to email	0	26	1
Q20	Finish attaching document to email	57	42	1
Q21	Flag Skills: Rotate image to match source.	86	52	1
Q22	Flag Skills: Flip image acorss vertial axis to match source.	86	66	1
Sample	**Score on Item Set**	**61**	**56**	**31**

Ministerial Council on Education, Employment, Training and Youth Affairs

ICT School Report

School	*De-Identified Primary School*	***State***	*VIC*	***Year***	*6*
				School N	6
Item Set	*DVD Day*			Sample N	1136

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Open spreadsheet from desktop	67	42	1
Q02	Sort data according to specific criteria	17	12	2
Q03	Delete the three selected rows with the films rated M.	92	80	2
Q04	Hide a column within a spreadsheet	67	59	1
Q05	Recognise need to use 'Filter' function	0	1	1
Q06	Filter information using 'Filter' function	67	42	1
Q07	Use the computer to check the spelling	67	89	1
Q08	Display specified hidden toolbar.	0	21	1
Q09	Left align selected text	33	65	1
Q10	Underline selected text	83	78	1
Q11	Insert a table with four columns and four rows.	50	53	1
Q12	Report - Choose a suitable review	33	15	1
Q13	Report - Locate and record information from within website: Cost DVDs to Your Door	83	62	1
Q14	Report - Locate and record information from within website: Cost Flicsonline	83	57	1
Q15	Report - Locate and record information from within website: Security DVDs to Your Door	33	20	2
Q16	Report - Locate and record information from within website: Security Flicsonline	50	40	1
Q17	Report - Evaluate websites and recommend one	39	28	3
A18	Report - End report in a suitable way	50	32	2
Q19	Recognise two problems of shopping online: Internet Security and	75	50	2
Sample	Reliability of online shopping Score on Item Set	51	42	26

Ministerial Council on Education, Employment, Training and Youth Affairs

ICT School Report

School	*De-Identified Primary School*	***State***	*VIC*	***Year***	*6*
				School N	9
Item Set	*Photo Album*			Sample N	1709

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Create a new folder called 'Pinxton' on the desktop.	56	34	1
Q02	Click on an icon that will open a web browser	89	78	1
Q03	Earlier today you visited a website about Pinxton. Go to that website again.	22	6	1
Q04	Recognise that computer viruses are written by people.	78	50	1
Q05	Recognise that the constant writing of new computer viruses requires virus protection software to be kept up to date.	67	53	1
Q06	Close your Internet browser	67	75	1
Q07	Open an email from a given sender.	78	74	1
Q08	Recognises that file compression software can be used to manage large files.	11	18	1
Q09	Save all the attachments to the Pinxton folder on the desktop	11	12	1
Q10	Photo album sequence of ideas	33	25	3
Q11	Photo album use of captions/text	41	30	3
Q12	Photo album persuasiveness - consistency of purpose	28	23	2
Q13	Photo album design consistency and appropriateness	22	16	3
Q14	Photo album design selection and application of features	11	13	3
Q15	State one advantage of using computer based photo albums.	78	40	1
Q16	State one advantage of using traditional photo albums.	67	30	1
Q17	Explain how to change the photo album to suit a new audience.	61	28	2
Q18	Identify three potential problems with downloading files from the internet.	37	42	3
Sample	Score on Item Set	41	32	30

Ministerial Council on Education, Employment, Training and Youth Affairs

ACER

ICT School Report

School	*De-Identified Primary School*	***State***	*VIC*	***Year***	*6*
				School N	2
Item Set	*Conservation*			Sample N	1166

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Search for a file with the word 'greenhouse' in it.	0	22	1
Q02	Open the file called 'Project_Information'.	100	91	1
Q03	Use the computer (spreadsheet) to work out the total cost in a column.	0	13	4
Q04	Copy column B and paste it into column C in a spreadsheet.	0	32	1
Q05	Change the contents of two cells in a spreadsheet.	100	40	1
Q06	Explain why a copied column total automatically updates when a cell in the column is altered.	0	11	1
Q07	Create a graph to display data from table (change over time).	0	11	1
Q08	Include horizontal and vertical axis labels with a chart	0	4	1
Q09	Include a title with a chart	0	10	1
Q10	Conservation project report - use of data	33	16	3
Q11	Conservation project report - integration	0	12	2
Q12	Conservation project report - consistency of tone	50	12	2
Q13	Conservation project report - structure	33	16	3
Sample	Score on Item Set	23	19	22

Ministerial Council on Education, Employment, Training and Youth Affairs

ICT School Report

School	*De-Identified Primary School*	***State***	*VIC*	***Year***	*6*
				School N	6
Item Set	*Help Desk*			Sample N	1132

Item Code	Descriptor	% correct		Max Score on Item
		School	***Sample***	
Q01	Explain why some software may include an expiry date.	0	34	1
Q02	Select a search engine most likely to return results for specific book.	50	46	1
Q03	Animate a ball to make it bounce in a single PowerPoint slideshow (using any method).	33	35	1
Q04	Select and explains the benefits of a course design involving a mixture of online and classroom tuition.	0	0	1
Q05	Apply style Heading 2 to a paragraph in a document.	0	0	1
Q06	Apply a consistent font type, font size and indent margin and to each paragraph in a document.	0	0	2
Q07	Select text from a paragraph and add appropriate columns (indicated by headings) in a table.	0	0	1
Q08	Insert row into table as required.	0	0	1
Q09	State one change in workstation setup that can help prevent back soreness.	100	73	1
Q10	Identify that copying and pasting text without acknowledging the author is inappropriate.	83	64	1
Q11	Recognise potential for misuse of ICT in chat-room context and suggests safety measures.	0	0	2
Q12	Change the name of a spreadsheet in a workbook and changes the colour of text in a spreadsheet.	33	44	1
Q13	Reformat a poster advertising a social function using style and design appropriate to purpose and audience.	56	48	3
Q14	Reformat a poster advertising a social function to maximise the communicative effect of the poster.	33	38	2
Q15	Resize columns in a table to improve layout.	0	0	1
Sample	Score on Item Set	48	47	11

APPENDIX D ICT LITERACY PROGRESS MAP

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

Level	***Proficiency level description***	***Examples of student achievement at this level***
6	Students working at level 6 create information products that show evidence of technical proficiency, and careful planning and review. They use software features to organise information and to synthesise and represent data as integrated complete information products. They design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work.	• *create an information product in which the flow of information is clear, logical and integrated to make the product unified and complete.* • *select appropriate key points and data from available resources and use their own words to include and explicate them in an information product.* • *use graphics and text software editing features such as font formats, colour, animations and page transitions, in ways that enhance the structure and communicative purpose of an information product.* • *include relevant tables and charts to enhance an information product and support these representations of data with text that clearly explains their purpose and contents.*
5	*Students working at level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products.*	• *create an information product in which the information flow is clear and logical and the tone and style are consistent and appropriate to a specified audience.* • *select and include information from electronic resources in an information product to suit an explicit communicative purpose.* • *use graphics and text software editing features such as font formats, colour and animations consistently within an information product to suit a specified audience.* • *create tables and charts that accurately represent data and include them in an information product with text that refers to their contents.* • *apply specialised software and file management functions such as using the history function on a web-browser to return to a previously visited page or sorting data in a spreadsheet according to a specified criterion.*
4	*Students working at level 4 generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this.*	• *create an information product in which the flow of information is clear and the tone is controlled to suit a specified audience.* • *generate searches that target relevant resources and then select relevant sections of these resources to include, with some modification and supporting text, in an information product.* • *apply graphics and text software editing features such as, font formats, colour and image placement consistently across a simple information product.* • *apply infrequently used software and file management functions such as displaying a specified hidden toolbar in a word processor, or using a single pull-down menu function to save all the attachments of an email to a new location.* • *identify security risks associated with internet data and explain the importance of respecting and protecting the intellectual property rights of authors.*

Level	*Proficiency level description*	*Examples of student achievement at this level*
3	Students working at level 3 generate simple general search questions and select the best information source to meet a specific purpose. They retrieve information from given electronic sources to answer specific, concrete questions. They assemble information in a provided simple linear order to create information products. They use conventionally recognised software commands to edit and reformat information products. They recognise common examples in which ICT misuse may occur and suggest ways of avoiding them.	• *create an information product that follows a prescribed explicit structure.* • *select clear, simple, relevant information from given information sources and include it in an information product.* • *use graphics and text software editing features to manipulate aspects such as colour, image size and placement in simple information products.* • *apply common software and file management functions such as left aligning selected text, rotating an image or creating and naming a new file on the desktop.* • *recognise the potential for ICT misuse such as plagiarism, computer viruses, and deliberate identity concealment and suggest measures to protect against them.*
2	Students working at level 2 locate simple, explicit information from within a given electronic source. They add content to and make simple changes to existing information products when instructed. They edit information products to create products that show limited consistency of design and information management. They recognise and identify basic ICT electronic security and health and safety usage issues and practices.	• *locate explicit relevant information or links to information from within a web-page.* • *make changes to some presentation elements in an information product.* • *apply simple software and file management functions such as, copying and pasting information from one column of a spreadsheet to another column or adding a web-page to a list of favourites (bookmarks) in a web-browser.* • *recognise common computer use conventions and practices such as the use of the '.edu' suffix in the URL of a school's website, the need to keep virus protection software up-to-date and the need to maintain good posture when using a computer.*
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	• *apply graphics manipulation software features such as adding and moving predefined shapes to reproduce the basic attributes of a simple image.* • *apply basic file and computer management functions such as opening and dragging-and-dropping files on the desktop.* • *apply generic software commands such as the 'save as' and 'paste' function or selecting all the text on a page.* • *recognise basic computer use conventions such as identifying the main parts of a computer and that the 'shut-down' command is a safe way to turn off a computer.*