acara AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

NAP – ICT Literacy Years 6 and 10

Assessment Framework 2020

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Contents

1 INTRODUCTION

1.1 Overview

The National Assessment Program (NAP) began as an initiative of ministers of education in Australia to monitor outcomes of schooling specified in the 1999 Adelaide Declaration on National Goals for Schooling in the Twenty-First Century (Adelaide Declaration). NAP was established to measure student achievement and to report this against key performance measures in relation to the national goals, using nationally comparable data across jurisdictions in each of literacy, numeracy, science, information and communication technologies (ICT), and civics and citizenship.

Literacy and numeracy achievements are measured and reported via the National Assessment Program – Literacy and Numeracy (NAPLAN). Achievement in science, civics and citizenship, and ICT literacy are assessed under the NAP – Sample Assessment program. These assessments are developed and managed by the Australian Curriculum, Assessment and Reporting Authority (ACARA) under the auspices of the Education Council.

In 2008, the Adelaide Declaration was superseded by the Melbourne Declaration on the Educational Goals for Young Australians (Melbourne Declaration). In 2019, the Melbourne Declaration was superseded by the Alice Springs (Mparntwe) Education Declaration. Throughout this time, the work of NAP has continued.

The first collection of data from students in the National Assessment Program – ICT Literacy (NAP – ICT Literacy) was in 2005; subsequent cycles of assessment have been conducted in 2008, 2011, 2014 and 2017. The sixth cycle of NAP – ICT Literacy takes place in 2021.[1] The content specifications for the NAP – ICT Literacy assessment were established before the first assessment cycle in 2005 and were largely unchanged through the first five assessment cycles, from 2005 to 2017.

In 2012, the Australian Curriculum: ICT Capability (AC: ICT Capability) was released. The AC: ICT Capability conceptualises ICT as a cross-disciplinary capability that comprises a set of interrelated organising elements that describe how to use ICT effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively. They cover learning in all learning areas at school and in life beyond school. (ACARA, 2012a)

In 2015, the Australian Curriculum: Digital Technologies (AC: Digital Technologies) was released. The AC: Digital Technologies aims to empower students to "shape change by influencing how contemporary and emerging information systems and practices are applied to meet current and future needs" (ACARA, 2015b). The AC: Digital Technologies aims to foster knowledge and understanding of information systems to enable students to be creative and discerning decision-makers when they

[1] The sixth cycle of NAP – ICT Literacy was originally scheduled to take place in 2020 but was deferred to 2021 as a result of the COVID-19 pandemic.

select, use and manage data, information, processes and digital systems to meet needs and shape preferred futures (ACARA, 2015a).

The educational outcomes measured and reported on in NAP – ICT Literacy and the outcomes achieved through the implementation of the AC: ICT Capability and AC: Digital Technologies are complementary and, in some areas, overlapping. They contribute individually and together to the goal of the Alice Springs (Mparntwe) Education Declaration that all young Australians become successful lifelong learners who "are productive and informed users of technology as a vehicle for information gathering and sharing, and are able to adapt to emerging technologies into the future" (Education Council, 2019).

As part of the work on NAP – ICT Literacy 2017, the NAP – ICT Literacy Assessment Framework was revised to describe and represent its relationship to the AC: ICT Capability and the AC: Digital Technologies. This revision of the NAP – ICT Literacy Assessment Framework for NAP – ICT Literacy 2021 is an extension of this work. It includes a revised definition and description of ICT literacy with two purposes. The first is to ensure that the NAP – ICT Literacy remains up to date in a world of rapid technological growth. The second is to allow for a stronger connection between what is measured, and reported on, in NAP – ICT Literacy and what is taught and learnt through the implementation of the AC: ICT Capability and the AC: Digital Technologies.

1.2 Purposes of NAP – ICT Literacy

One purpose of NAP – ICT Literacy is to measure and describe student achievement in ICT literacy and to monitor changes in achievement over time. Data collected as part of the first cycle of NAP – ICT Literacy in 2005 were used to establish the NAP – ICT Literacy achievement scale. The scale comprises six achievement levels that describe the achievement of students across Year 6 and Year 10. The level descriptions have been updated as new assessment content has been progressively included in each cycle of NAP – ICT Literacy. The scale metric was set in 2005, with a mean score of 400 and standard deviation of 100 scale points for the national Year 6 sample. NAP – ICT Literacy scale scores across all assessment cycles have been reported on this same metric.

A further purpose of all NAP sample assessments (in ICT literacy, civics and citizenship, and science literacy) is to monitor, and report on, student attainment of key performance measures (KPMs) defined for each area. The proportion of students achieving at or above the proficient standard for each of Year 6 and Year 10 is the national KPM for ICT literacy specified in the Measurement Framework for Schooling in Australia (ACARA, 2019a).

The proficient standards "represent a 'challenging but reasonable' expectation of student achievement at a year level with students needing to demonstrate more than elementary skills expected at that year level" (ACARA, 2019a, p. 5). The proficient standards in NAP – ICT Literacy (one for Year 6 and one for Year 10) were established as a result of consultations with ICT experts and representatives from all states and territories and all school sectors as part of the inaugural assessment in 2005. The standards-setting group included practising teachers with specific ICT

expertise, ICT curriculum experts and educational assessment experts. The procedures followed by the group are outlined in the NAP – ICT Literacy public report (MCEETYA, 2007, pp. 46–47). The proficient standard for Year 6 is the boundary between levels 2 and 3 on the NAP – ICT Literacy scale. The proficient standard for Year 10 is the boundary between levels 3 and 4 on the scale.

In addition to reporting student ICT literacy achievement with reference to the NAP – ICT Literacy achievement scale, the public reports for each cycle of NAP – ICT Literacy include details of the proportion of students meeting the proficient standard in each of Year 6 and Year 10 nationally, by state and territory, and according to their Indigenous status, sex, language background, geographic location and socio-economic background.

NAP – ICT Literacy also aims to contribute to educators' and policymakers' understanding of the contexts in which students in Year 6 and Year 10 are using ICT and developing ICT literacy. To this end, the program includes measures obtained from students' responses to a survey relating to students' access to ICT resources, their experience of using ICT, their use of ICT outside of school and at school, and their attitude to ICT. Students are asked about their use of software applications for a variety of purposes and to report on their experience of classroom activities associated with ICT. The NAP – ICT Literacy public reports include details both of students' responses to these questions and analyses of the associations between selected measures of ICT use and ICT literacy achievement. NAP – ICT Literacy public reports can be downloaded from the National Assessment Program website at: www.nap.edu.au/results–and–reports/national–reports.

In order to support educators to make use of and engage with the content of the NAP – ICT Literacy assessment, a suite of school-release materials is made publicly available through the ACARA website as part of each assessment cycle. These resources provide detailed information about the NAP – ICT Literacy assessment, together with released materials and scoring guides that have been used in the assessments. NAP – ICT Literacy school release materials can be downloaded from the National Assessment Program website at: www.nap.edu.au/nap–sample–assessments/school–support.

1.3 Purpose of the NAP – ICT Literacy Assessment Framework

The NAP – ICT Literacy Assessment Framework outlines the key aspects of the program. In addition to providing a brief description of the origin and development of NAP – ICT Literacy, it provides a description of what is assessed in NAP – ICT Literacy and how the assessment is conducted. Furthermore, the assessment framework positions NAP – ICT Literacy in the broader context of the Australian Curriculum: ICT Capability and the Australian Curriculum: Digital Technologies.

1.4 Development of the NAP – ICT Literacy Assessment Framework (2005–2021)

NAP – ICT Literacy 2005–2017

Defining and describing ICT literacy (2005–2017)

In preparation for the first cycle of NAP – ICT Literacy in 2005, an expert committee was convened to create an assessment domain for ICT literacy that could be used to frame development of NAP – ICT Literacy (MCEETYA, 2005). The assessment domain included a definition of ICT literacy as well as an elaboration of the definition through a set of six ICT literacy processes that can be demonstrated across three strands. Together, the definition and its elaboration have articulated the achievement construct measured and reported on in NAP – ICT Literacy from 2005 to 2017.

The definition of ICT literacy underpinning NAP – ICT Literacy 2005–2017 was:

> *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.*

The six ICT literacy processes underpinning NAP – ICT Literacy 2005–2017 are listed in table 1.1 below.

Table 1.1: ICT literacy processes described for NAP – ICT Literacy 2005–2017

Process	Description
Accessing information	identifying information requirements and knowing how to find and retrieve information
Managing information	organising and storing information for retrieval and reuse
Evaluating	reflecting on the processes used to design and construct ICT solutions and judgements regarding the integrity, relevance and usefulness of information
Developing new understandings	creating information and knowledge by synthesising, adapting, applying, designing, inventing or authoring
Communicating	exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium
Using ICT appropriately	critical, reflective and strategic ICT decisions and considering social, legal and ethical issues

Furthermore, the NAP – ICT Literacy assessment domain organised content according to three strands: working with information; creating and sharing information; and using ICT responsibly. The three ICT literacy strands were regarded as establishing contexts in which ICT literacy could be expressed through the application of the six processes, although it was accepted that the prominence of the six processes could vary across the strands.

Mapping NAP – ICT Literacy (2005–2017) to the Australian Curriculum

Before the release of the Australian Curriculum: ICT Capability in 2012, and the Australian Curriculum: Digital Technologies in 2015, national standards for ICT literacy–related learning and achievement were instantiated only in the Statements of Learning for Information and Communication Technologies (ICT) (Curriculum Corporation, 2006) and NAP – ICT Literacy.

While the definition and description of ICT literacy, used in NAP – ICT Literacy, remained unchanged during 2005–2017, information about the relationship between what is assessed in NAP – ICT Literacy and the Statements of Learning for ICT, the AC: ICT Capability and the AC: Digital Technologies has been provided over successive cycles of NAP – ICT Literacy. The inclusion of this information is summarised below.

NAP – ICT Literacy 2008

- The NAP – ICT Literacy 2008 public report included detail of the relationship between NAP – ICT Literacy and the Statements of Learning for ICT (MCEEDYA, 2009).

NAP – ICT Literacy 2011

- The NAP – ICT Literacy 2011 public report (released in 2012) included a mapping of the processes in the ICT Literacy assessment domain and the organising elements in each of the AC: ICT Capability and the Statements of Learning for ICT (see ACARA, 2012b).

NAP – ICT Literacy 2014

- The NAP – ICT Literacy assessment domain was revised and published as the NAP – ICT Literacy 2014 Assessment Framework. This assessment framework included explicit information about the relationship between the measurement of ICT literacy in NAP – ICT Literacy and the AC: ICT Capability and the Statements of Learning for ICT.
- The NAP – ICT Literacy 2014 public report included a summary of the relationship between NAP – ICT Literacy and the AC: ICT Capability and the Statements of Learning for ICT (ACARA, 2015).
- Reports provided to schools that participated in the assessment included a mapping of each assessment item to the AC: ICT Capability in addition to the NAP – ICT Literacy Assessment Framework.

NAP – ICT Literacy 2017

- The NAP – ICT Literacy 2014 Assessment Framework was revised to include a mapping of the ICT literacy processes used in NAP – ICT Literacy to each of the AC: ICT Capability and the AC: Digital Technologies. The framework included extensive detail about how the mapping exercise was completed and provided details of the degree of correspondence between the NAP – ICT Literacy 2017 assessment and the AC: Digital Technologies.

- The NAP – ICT Literacy 2017 public report (ACARA, 2018) included a summary of the relationship between NAP – ICT Literacy and the AC: ICT Capability and the AC: Digital Technologies.
- Reports provided to schools that participated in the assessment included a mapping of each assessment item to the AC: ICT Capability, NAP – ICT Literacy Assessment Framework and, where applicable, to the AC: Digital Technologies.

Revising the ICT literacy construct for use in NAP – ICT Literacy

In response to the evolution of NAP – ICT Literacy from 2005 to 2017, ongoing developments in technology and the implementation of the AC: ICT Capability and the AC: Digital Technologies, the decision was made by ACARA to review the construct assessed in NAP – ICT Literacy.

In 2018, as part a component of this review, ACARA hosted a forum where members of state and territory school sectors came together to consider the scope of the NAP – ICT Literacy 2021 assessment and possible future directions. The forum provided an opportunity to reflect on how the elements and sub-elements of a range of general capabilities, including ICT Capability, Critical and Creative Thinking, Numeracy and Personal and Social Capability, relate to the Digital Technologies curriculum, and whether this has implications for revising the NAP – ICT Literacy 2021 Assessment Framework and assessment content.

In 2019, ACARA established a working group comprising ICT and Digital Technologies education experts from all Australian states and territories, with the primary focus of reviewing feedback and recommendations from the 2018 forum, formulating the revised assessment framework and reviewing the development of the NAP – ICT Literacy 2021 test and survey instruments.

The revised NAP – ICT Literacy construct definition and structure presented in chapter 2 were developed in response to the feedback and recommendations of the NAP – ICT Literacy Working Group and in consultation with ACARA curriculum specialists.

1.5 NAP – ICT Literacy participants and instruments

Participants and sampling

NAP – ICT Literacy is completed by representative randomly selected samples of Australian school students in Year 6 and Year 10. In most states and territories, the assessment is conducted in October.

The sampling involves two stages. The first stage of sampling involves selecting schools within explicit strata formed by state or territory and school sector.[2] Within each explicit stratum, the geographic location, a school measure of socio-economic

[2] Explicit stratification means that separate school samples were drawn for each sector within each jurisdiction.

status[3], and school size were all used for implicit stratification.[4] A school's probability of selection was proportional to the number of students enrolled in the relevant year level (either Year 6 or Year 10), which meant that schools with larger numbers of students at the relevant year level were more likely to be selected for participation.

The second stage of sampling involves the drawing of a random sample of 20 students from the target year level in each sampled school. Where fewer than 20 eligible students were enrolled in the target grade (that is, in small schools), all students were selected to participate.

While the exact number of schools sampled has varied across cycles of NAP – ICT Literacy, it has been typically in the vicinity of 330 schools at Year 6 and 310 schools at Year 10 corresponding to slightly more than 6,000 students at each year level (noting that not all sampled schools have 20 students at the target year level).

Instruments

ICT literacy assessment

The assessment design for NAP – ICT Literacy was established as part of the first cycle in 2005 and has been used in all cycles thereafter. The assessment instrument comprises computer-based test modules, each of which can be completed in a maximum of 20 minutes (controlled by the testing software). Each module follows a linear narrative sequence designed to reflect students' typical 'real-world' use of ICT. The modules include a range of school-based and out-of-school-based themes. In almost all cases, the modules comprise a sequence of 8–10 tasks culminating in a large task. All tasks are completed using purpose-built software applications that make use of the conventions of user–interface design.

Following completion of each NAP – ICT Literacy cycle, some assessment modules are released on the National Assessment Program website as exemplar materials that illustrate and explicate the assessment content and information about how the assessment tasks are scored. These can be accessed at: www.nap.edu.au/nap–sample–assessments/school–support.

The remaining assessment modules are held secure for use in the subsequent assessment cycle so that student achievement in the subsequent cycle can be reported on the NAP – ICT Literacy proficiency scale and enabling trends in student achievement to be reported across cycles.

New assessment modules are developed for inclusion in each new assessment cycle. In addition to replacing the assessment modules that have been released, development of new modules for each cycle allows for the NAP – ICT Literacy content to remain up to date and reflect changes in software environments and use over time. As part of each new assessment cycle, analyses are conducted to check

[3] The Australian Bureau of Statistics' (ABS) Index of Education and Occupation was used. This is one of the ABS socio-economic indexes for areas (SEIFA).

[4] Implicit stratification means that within the sampling frame, schools were grouped and sorted by implicit stratification variables so that adjacent schools were similar to each other.

that the new modules measure the same dimension (ICT literacy) as the established or continuing modules. For NAP – ICT Literacy 2021, five new modules have been developed. Two of the new modules have a focus on tasks associated with the AC: ICT Capability and three have a focus on tasks associated with the AC: Digital Technologies.

Each student completes four NAP – ICT Literacy assessment modules. As there are more than four assessment modules in the total instrument, the modules are allocated across students using a fully balanced design in which each module is presented an equal number of times in each of the four possible positions in the assessment. The individual sequences of modules are randomly assigned to students.

Student survey

The first cycle of NAP – ICT Literacy in 2005 incorporated a survey asking students to respond to questions on their experience using ICT, frequency of use, their use of different types of ICT and attitudes towards ICT.

In order for the survey to remain relevant and reflect changes in ICT use over time, the student survey has been revised across subsequent NAP – ICT Literacy cycles in consultation with the NAP – ICT Literacy Working Group and ACARA curriculum specialists. The survey has evolved to collect information on the following topics:

- student experience using ICT
- different types of ICT used, and where they are used
- perceptions of importance and self-efficacy of using ICT
- frequency of using ICT for study, entertainment, communication and technological applications both at school and outside of school
- what ICT applications are used for school-related purposes, how ICT is used in the classroom environment and what ICT-related issues are being taught to students.

2 NAP – ICT LITERACY CONSTRUCT

2.1 Overview

This chapter presents the ICT literacy construct revised for NAP – ICT Literacy 2021. As described in chapter 1, the ICT literacy construct has been developed following a review of the construct used in NAP – ICT Literacy from 2005 to 2017. The revision is a response to the evolution of NAP – ICT Literacy over this time, ongoing developments in ICT and the implementation of the AC: ICT Capability and the AC: Digital Technologies. The definition, structure and described content of the NAP – ICT Literacy 2021 construct were developed with reference to recommendations coming from the 2018 – ICT Literacy forum (as described in section 1.4) and in consultation with the NAP – ICT Literacy Working Group and ACARA curriculum specialists.

The NAP – ICT Literacy 2021 construct has been developed in order to:

- support the ongoing assessment and reporting of student achievement against the existing NAP – ICT Literacy achievement scale
- integrate the NAP – ICT Literacy assessment with the AC: ICT Capability and the AC: Digital Technologies
- support the ongoing initiative to keep the NAP – ICT Literacy assessment content up to date and representative of learning relevant to the Australian Curriculum.

The construct incorporates curriculum and assessment content from the previous NAP – ICT Literacy Assessment Framework, the AC: ICT Capability and the AC: Digital Technologies. This is achieved by conceptualising each of the three as problem-solving frameworks. When considering ICT literacy, students are presented with information literacy and communication problems (such as the need to research and present digital information on a given topic). When considering Digital Technologies, students are presented with practical real-world needs, opportunities or problems that require technology-based solutions (such as to improve the usability of a user interface and define and develop the branching logic of a digital story). In each case, students are expected to research, plan, execute and evaluate digital solutions addressing a defined problem.

Both the AC: ICT Capability and the AC: Digital Technologies provide relevant curriculum paradigms for framing problems, planning, implementing and evaluating solutions. In NAP – ICT Literacy, digital solutions can be information based and technology based. As such, the revised construct for NAP – ICT Literacy accommodates both problem-solving contexts.

2.2 Defining ICT literacy

As presented in chapter 1, the definition of ICT literacy underpinning NAP – ICT Literacy 2017, and from 2005 to 2014, was:

> *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.*

The revised definition of ICT literacy for NAP – ICT Literacy 2021 strongly references and extends the previous definition. It continues to present the use of ICT as a medium for demonstrating information literacy competencies and further includes reference to the concepts of computational thinking, design thinking and systems thinking, which underpin the content associated with the AC: Digital Technologies.

The inclusion of these new concepts shifts the emphasis of ICT literacy from the use of ICT for the reception, production and communication of information to the use of ICT as the means for developing solutions across a broader range of ICT-based problem-solving contexts. In this definition, both historical information literacy contexts (for example, producing a digital information product) and contexts that require the development of digital solutions (for example, developing a computer algorithm) are considered as constituent elements of ICT literacy. The definition was revised in consultation with the NAP – ICT Literacy Working Group and ACARA curriculum specialists.

The revised definition of ICT literacy for NAP – ICT Literacy 2021 is:

> *the ability to use ICT appropriately and safely to access, manage and evaluate information; develop new understandings; apply computational, design and systems thinking to create solutions; communicate and collaborate with others; and engage productively with emerging and future technologies.*

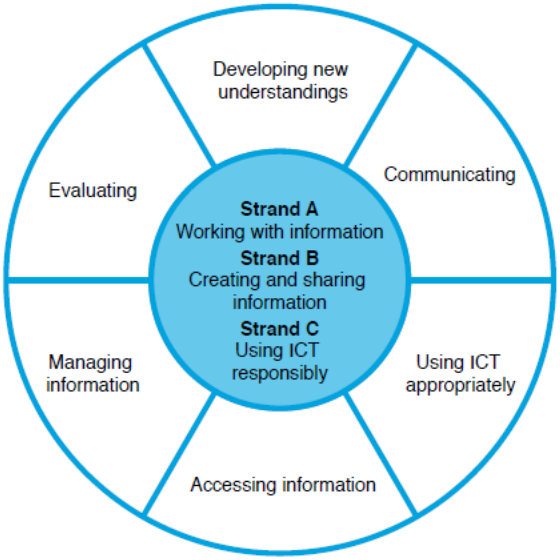
The Alice Springs (Mparntwe) Education Declaration states that all young Australians become successful lifelong learners who "… are able to adapt to emerging technologies into the future" (Education Council, 2019, p. 7). This outcome is instantiated in the concluding clause of the above definition that ICT literacy includes the ability to *engage productively with emerging and future technologies.* It provides both a frame of reference for, and an intended outcome of, the development of ICT literacy.

The emphasis on problem-solving and the inclusion of concepts that underpin the AC: Digital Technologies were factors that contributed to the need to revise and restructure the description of ICT literacy used to underpin NAP – ICT Literacy 2021.

2.3 Revising the structure of the NAP – ICT Literacy construct

The NAP – ICT Literacy 2005–2017 construct described ICT literacy in terms of three strands that represented contexts in which ICT literacy could be expressed through the application of six processes (see section 1.4). The strands emphasised information literacy contexts and the processes could be expressed in any one of the strands (Figure 2.1).

Figure 2.1: ICT literacy processes and strands for NAP – ICT Literacy 2005–2017



The revised definition of ICT literacy for use in NAP – ICT Literacy 2021 (page 13) suggests a broader range of contexts and processes that include the creation of digital solutions through the application of the core concepts of the AC: Digital Technologies. As well as expanding the range of content included in the NAP – ICT Literacy construct, it was decided that the structure of the construct should be revised to accommodate this new content.

The structure for the revised NAP – ICT Literacy construct draws on the structure adopted by the International Computer and Information Literacy Study (ICILS), a cross-national study of computer and information literacy and computational thinking (Fraillon et al., 2019b), and is consistent with the use of assessment 'sub-areas' in the 2018 US National Assessment of Educational Progress (NAEP) Technology and Engineering Framework, which includes ICT, design and systems, and technology and society (NAGB, 2018). Under this revised structure, the ICT literacy content is organised into four strands, each of which represents a category of knowledge, skills, processes, understandings and actions. Each strand in turn is divided into aspects, which represent different categories of content within each strand.

The first strand relates to students' understanding of ICT and digital systems that allow them to effectively research, communicate and execute project plans for the purpose of engaging in computer-based problem-solving. The second and third strands relate to students' use of ICT to investigate, research, plan solutions and to further implement and evaluate solutions. The fourth strand relates to the application of social and ethical protocols and practices when using ICT. Students' demonstrations of achievement relating to the application of social and ethical protocols and practices may relate to information-based ICT contexts or contexts requiring digital solutions.

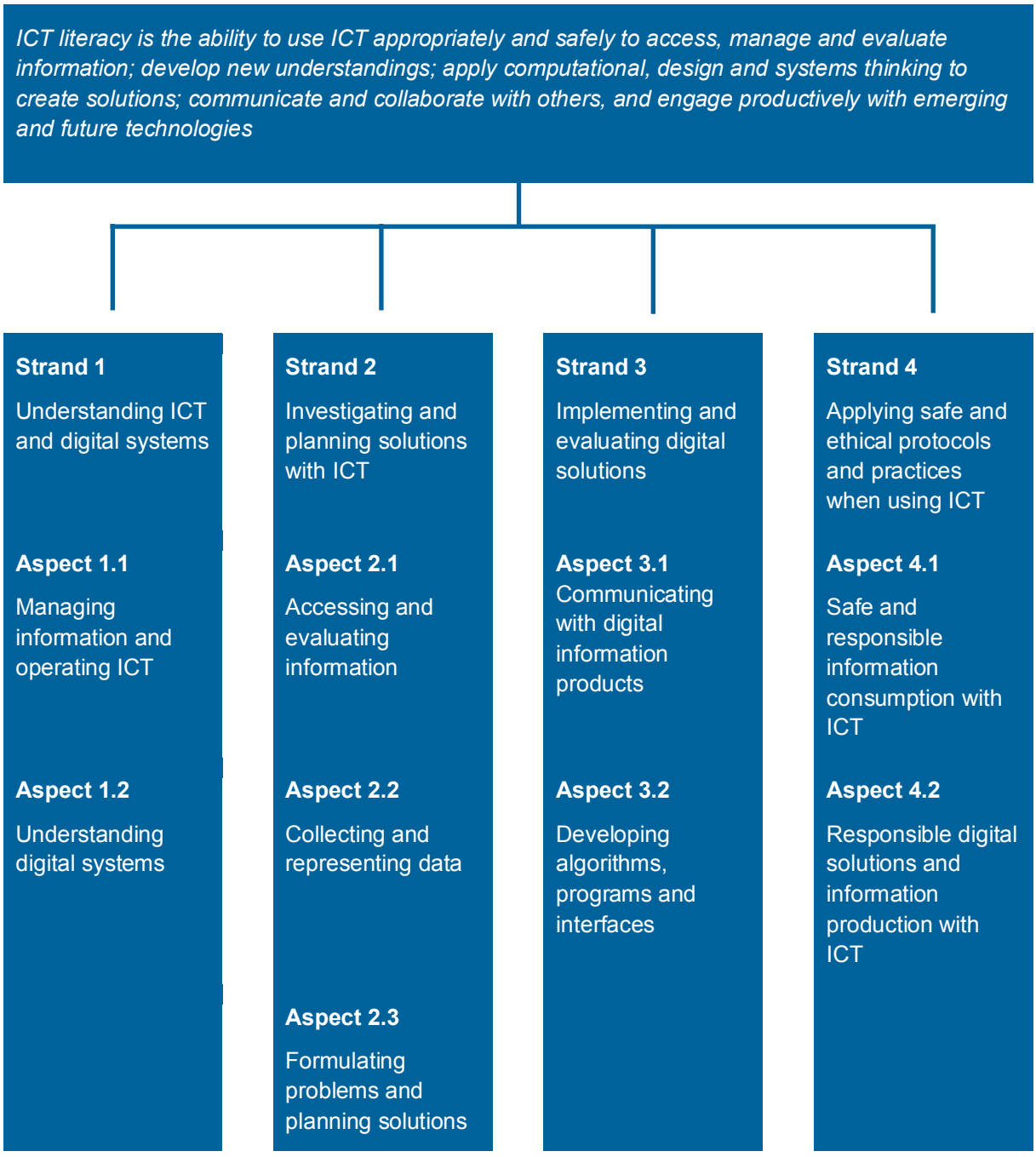
2.4 Structure of the NAP – ICT Literacy construct

The NAP – ICT Literacy construct includes the following elements:

- Strand: This refers to the overarching conceptual category for framing the skills, knowledge and actions addressed by the NAP – ICT Literacy instruments.
- Aspect: This refers to the specific content category within a strand.

The construct comprises four strands, which each contain 2–3 aspects. The structure of the construct is summarised in Figure 2.2 and the content of each strand is described in detail in section 2.5.

Figure 2.2: NAP – ICT Literacy 2021 construct definition, strands and aspects



2.5 Strands and aspects of the NAP – ICT Literacy construct

Strand 1. Understanding ICT and digital systems

This strand includes technical knowledge, skills and understanding relating to the principles of information processing and knowledge about the conventions of ICT and digital systems.

Aspect 1.1 Managing information and operating ICT

This aspect includes knowledge of software interface conventions that enable the operation of ICT. Examples include:

- file systems
- databases
- productivity software
- networked information communication
- communications and project management software.

Knowledge of software and interface conventions supports a range of procedures relating to the way information can be stored, retrieved, manipulated and transmitted using ICT. For example, at the declarative level, a student may describe the steps involved in moving a file from one folder to another and the advantages or disadvantages of using ICT solutions for particular contexts, such as the benefits of compressing a file before transferring it to a remote server. At the procedural level, a student may locate a file in a folder, filter records in a database, format text in a document, retrieve files from a remote drive, compose and send messages and schedule tasks in a calendar.

Aspect 1.2 Understanding digital systems

This aspect includes an understanding that digital systems operate at different levels of abstraction, wherein each level represents a different model of the same information with varying amounts of detail, and that higher levels build on lower levels. At the declarative level, a student may, for example, describe the way digital systems use binary data to represent numbers, characters, pixels, audio and video.

This aspect also includes an understanding that software programs comprise algorithms that perform operations on data and can interoperate with other programs to form complex software systems, such as operating systems and networks.

At a procedural level, a person may, for example, monitor a digital system in operation, monitor outcomes from that system and draw conclusions about the causal relationship between inferred algorithmic rules and the outcomes. These procedural skills are based on a conceptual understanding of fundamental computing operations, such as iteration, looping and conditions, and arithmetic, comparison and logical operators.

Strand 2. Investigating and planning solutions with ICT

This strand includes accessing and evaluating digital information, and acquiring, validating and representing data for the purpose of formulating problems and planning solutions.

Aspect 2.1 Accessing and evaluating information

This aspect includes identifying information requirements, locating information and sources, and evaluating the relevance, reliability and veracity of sources. Also included in this aspect is an understanding of how digital information is authored, invented, created, published, distributed, recommended and consumed, and the application of knowledge and understanding of digital systems to evaluate the usefulness, relevance and credibility of digital information.

Following are examples of tasks that demonstrate a person's ability to access and evaluate information:

- selecting the most relevant search engine result for a particular topic
- differentiating between sponsored and non-sponsored content in search engine results or social media
- adjusting the parameters of an advanced search to narrow the search results according to specific criteria
- recognising and explaining characteristics of digital information (such as biased product recommendations motivated by financial incentives from affiliate programs) that detract from its credibility
- recognising that published content may be motivated by purposes other than the sharing of knowledge
- using strategies to confirm the veracity of information (such as cross-checking information from multiple sources).

Aspect 2.2 Collecting and representing data

This aspect includes applying protocols for collecting, validating, organising and storing data in digital systems for use with algorithms and software. It also includes, for example:

- using software to represent digitally stored data in a variety of forms (such as in tables, flow charts or graphs)
- using simulations of complex systems to produce data that can show patterns or characteristics of the system's behaviours that are otherwise hidden when viewed from an abstract level.

At the declarative level, a student may, for example, define data types such as number, date and time, text and Boolean, and the relative advantages and disadvantages of qualitative and quantitative data for a particular problem-solving context. They can interpret conventional charts and graphs and describe the content, such as specifying the rate of change in temperature over time or increased volume

at a time interval in a waveform representing sound. At the procedural level, a student may, for example, use software to modify tabular data and configure software to represent tabular data, such as correctly assigning numbers and dates to a vertical and horizontal axis of a line chart.

Aspect 2.3 Formulating problems and planning solutions

This aspect includes the decomposition of problems into smaller parts, planning how components of a solution can work together as a whole, planning the process of developing a solution (including information or resources required to implement a solution) and establishing criteria for evaluating the performance, quality or completeness of a solution. Problem contexts can include the need to produce information products or computer-based automations. The formulation of a problem in these contexts typically involves consideration of how the needs of an audience or user may inform the medium, format, presentation and complexity of a solution.

The following examples are tasks that demonstrate a person's ability to formulate problems and plan solutions:

- breaking down a complex problem into smaller, more manageable parts
- identifying relevant aspects of solutions to similar problems
- identifying the relative merits of alternative solutions
- explaining why one communication medium is more appropriate than another for a particular purpose (such as a presentation or a webpage)
- creating a flow chart to represent relationships between components of a system or steps in a process
- identifying steps in a process that can be programmatically automated
- critiquing a user interface with consideration to the user experience.

Strand 3. Implementing and evaluating digital solutions

This strand includes the use of digital tools for producing information products that suit an audience, context and medium. It also includes the development of digital solutions, such as algorithms, programs, user interface designs and systems that meet defined requirements.

Aspect 3.1 Communicating with digital information products

This aspect includes the production of digital information products that have a communicative purpose and can be presented in a variety of forms, such as emails, instant messages, documents, presentations, websites, videos and animations. It also includes the processes of synthesising, adapting, applying, designing, inventing and authoring. This aspect includes the evaluation of information products to ensure that the communicative purpose is enhanced by the digital medium.

The following examples are tasks that demonstrate a student's ability to produce digital information products:

- changing the size and formatting of a heading in a document to create structural hierarchy
- using bullet points to make a list easier to read
- resizing and positioning an image on a canvas, relative to another element, to create a conceptual relationship
- changing colours of bars in a bar chart to match the corresponding labels in a legend
- designing and writing a presentation that integrates text, data and images from multiple sources
- assembling multiple video clips into a single timeline to communicate a coherent message.

Aspect 3.2 Developing algorithms, programs and interfaces

This aspect includes the development of computer algorithms, programs and user interfaces (digital solutions) that solve a particular problem or optimise an existing solution. The formulation of a problem may be expressed as a set of functional requirements for a software application or design specifications for an improved user experience and can be operationalised in a variety of forms such as algorithms (executed as computer code functions), interactive user interfaces, software applications and software systems. This aspect includes the evaluation of digital solutions to ensure that the stated objectives of the requirements are met and that the needs of a user are satisfied.

The following examples are tasks that demonstrate a student's ability to develop digital solutions:

- naming a variable and assigning it a value
- specifying valid syntax to query records in a database
- creating an expression using relational (for example, < and >) or logical (for example, AND, OR and NOT) operators to return a value
- creating an algorithm that uses a repeat loop with a stopping condition
- arranging the location of buttons on a user interface according to design conventions
- integrating a variable in an interface (for example, a variable that represents the name of a contact in a contacts application).

Strand 4. Applying safe and ethical protocols and practices when using ICT

The strand includes a range of practices when using ICT in a broad range of contexts from sharing and producing information to employing protection mechanisms for digitally stored private information. It also includes protocols for testing and validating

the safety of digital solutions and an evaluation of the social impact of those solutions.

Aspect 4.1 Safe and responsible information consumption with ICT

This aspect addresses ICT and information use by students as individual consumers. It focuses on protection of personal safety (including data security) and responsible individual use.

The following examples reflect content and contexts relating to safe and responsible consumption of digital information and personal ICT use:

- password use and protection
- protection of personal data
- phishing
- catfishing
- social media bots
- algorithm bias.

The following examples reflect tasks that provide evidence of a person's ability to safely and responsibly consume information with ICT:

- identifying characteristics that influence the strength of passwords
- using multiple layers of security such as multifactor authentication
- explaining the consequence(s) of making one's own personal information publicly available
- explaining the techniques used in a phishing scam
- describing strategies for verifying the identity of a stranger's online persona
- identifying characteristics of bots used to disseminate information
- recognising that decisions or recommendations made by algorithms may require additional personal evaluation.

Aspect 4.2 Responsible digital solution and information production with ICT

This aspect includes the social, legal and ethical issues relating to the production, distribution and communication of digital information and the design of digital solutions.

The following examples reflect content and contexts relating to the responsible design of digital solutions and information production with ICT:

- cyberbullying
- deepfakes
- protecting the personal information of others

- preventing malicious software distribution (viruses, malware, ransomware, etc.)
- attribution and copyright.

The following examples reflect tasks that provide evidence of a student's ability to produce and use ICT responsibly:

- describing protocols for appropriate behaviour on a social media platform
- seeking permission to post a photo of someone online or use their likeness in a digital information product
- using encryption to store a user's password or other sensitive information
- testing a software application for bugs
- integrating human verification systems
- suggesting ways to collect more data to minimise bias used by an algorithm.

2.6 The NAP – ICT Literacy construct and the Australian Curriculum

The definition of ICT literacy and the content of the strands of the NAP – ICT Literacy 2021 construct have been informed by the AC: ICT Capability and the AC: Digital Technologies.

Better aligning the content of NAP – ICT Literacy to the AC: ICT Capability and the AC: Digital Technologies was central to revision of the NAP – ICT Literacy construct. Content from the AC: Digital Technologies, which was related to ICT as conceptualised by NAP – ICT Literacy, was summarised and aligned with the processes from the NAP – ICT Literacy construct.

The AC: ICT Capability is organised into five interrelated elements:

- applying social and ethical protocols and practices when using ICT
- investigating with ICT
- creating with ICT
- communicating with ICT
- managing and operating ICT.

The definition and elaboration of the NAP – ICT Literacy construct are very closely aligned with the five elements of the AC: ICT Capability. While there is not necessarily a one-to-one correspondence between the elements of the AC: ICT Capability and the strands and aspects in the ICT Literacy construct, the correspondence between the two is clear. *Managing and operating ICT* aligns closely to the focus of strand 1 of the ICT Literacy construct (Understanding ICT and digital systems), *Investigating with ICT* aligns closely to strand 2 (Investigating and planning solutions), *Creating with ICT* and *Communicating with ICT* align closely to strand 3 (Producing digital information products), and *Applying social and ethical protocols and practices when using ICT* aligns closely to strand 4 (Applying safe and ethical protocols and practices when using ICT).

A number of key concepts underpin the AC: Digital Technologies. These establish a way of thinking about needs, opportunities, problems and information systems, and provide a framework for knowledge and practice. The key concepts of the AC: Digital Technologies represented in the NAP – ICT Literacy construct are:

- abstraction
- data collection, data representation and data interpretation
- specification, algorithms and implementation
- digital systems
- interactions and impacts.

The concepts of abstraction, data collection, representation and interpretation, specification, algorithms and implementation correspond to the key elements of computational thinking (ACARA, 2015).

The elements of the AC: ICT Capability and the concepts of the AC: Digital Technologies span the NAP – ICT Literacy 2021 construct and provide a connection and a scaffold for measuring ICT literacy. While the structure and focus of the AC: Digital Technologies are different from that of the AC: ICT Capability, the content of some of the strands and sub-strands is complementary and, in some areas, overlapping.

3 CONTEXTUAL FRAMEWORK

3.1 Overview

The principal aims of NAP – ICT Literacy are to assess the ICT literacy of Australian students in Year 6 and Year 10 and report on student attainment of key performance measures (KPMs) for this domain. In addition to reporting the proportions of Year 6 and Year 10 students who attain the proficient standards in ICT literacy, the assessment program also generates data that describe the variation in ICT literacy among Year 6 and Year 10 students. Contextual information collected during NAP – ICT Literacy is used to better understand the factors associated with variations among students in ICT literacy. This section documents the contextual data that are collected as part of NAP – ICT Literacy and briefly outlines findings from educational research about the relationship of contexts reflected in these data to ICT literacy.

Each cycle of NAP – ICT Literacy has collected information about student year level (Year 6 or Year 10), the state and territory in which a student attends school, and the geographic location of the school attended by a student. In addition, it has collected for each student details relating to their socio-economic background (parental education and occupation), sex, Indigenous status and language background. In NAP – ICT Literacy 2005 and 2008, these student background data were collected as part of the student survey. Since the third cycle of 2011, these student background data have been collected from schools and school systems.

The NAP – ICT Literacy student survey collects data on other contextual information related to ICT literacy: access to ICT resources, experience of using ICT, use of ICT outside of school and at school, and attitudes to ICT. Students also indicate their use of software applications for a variety of purposes and their experience of classroom activities associated with ICT.

3.2 Classifying contextual influences on ICT literacy

Contextual influences may operate as group influences (system, school or community factors) or as an individual influence (as a home or individual factor) (see Fraillon et al., 2019a). These are referred to as levels of influence because influences closer to the individual are nested within influences that affect groups of individuals. In addition, contextual influences at each of these levels can be thought of in terms of whether they operate prior to ICT learning (antecedents) or at the same time as ICT learning (processes).

Group contextual influences

Group contextual influences can refer to characteristics of education systems, schools or communities. Year level (Year 6 or 10) is considered to be a group contextual influence because the AC: ICT Capability (ACARA, 2012) and the AC: Digital Technologies (ACARA, 2015) define relevant teaching and learning for students at each year level. This does not preclude considering year level as an individual characteristic for some analyses.

Differences among education systems in the emphasis placed on, and the resources provided for, ICT learning can influence the development of ICT literacy, and in international studies this is an important contextual influence (Fraillon et al., 2019b). However, for NAP – ICT Literacy in Australia, such differences would be limited because the Australian Curriculum specifies common elements concerned with ICT Capability and Digital Technologies, and data about resources and implementation are not gathered as part of NAP – ICT Literacy.

School resources and practices can influence ICT learning in terms of what is taught and how it is taught (as processes). In NAP – ICT Literacy, some of this information is collected as individual student influences (discussed in the following section) with respect to students' reported experience of learning about ICT in their school.

Community characteristics such as geographic location can influence the development of ICT literacy through differential access to internet facilities and other ICT resources. School geographic location is included in NAP – ICT Literacy (as metropolitan, regional or remote) (ACARA, 2018).

Individual contextual influences

Individual contextual influences can be enduring background characteristics of students, developed characteristics that emerge as part of their development or concurrent ICT-related activities.

In NAP – ICT Literacy, background characteristics such as sex, socio-economic background, Indigenous status and language background are included as part of the context for the development of ICT literacy (as antecedents) because they are considered to be associated with opportunities to use ICT in homes and other immediate out-of-school contexts.

Developed characteristics are also associated with individuals but change as individuals grow and become more directly associated with ICT. Most studies of ICT literacy include student experience of ICT (years for which they have been using ICT) and familiarity with ICT (the frequency with which they use ICT at home) as contextual factors that shape the ICT literacy of students (Fraillon et al., 2019b). Student attitudes to the use of ICT are also often considered to be developed characteristics associated with ICT learning.

Concurrent ICT-related activities refer to the extent to which students experience ICT at school or out of school. These activities include ICT literacy learning during class and using ICT for study tasks. These are processes that directly influence ICT literacy learning but they are constrained by antecedent factors and factors found at higher levels. These process factors can be influenced by the level of (existing) ICT literacy. For example, the level and scope of classroom exercises using ICT generally depend on the existing ICT literacy of the students.

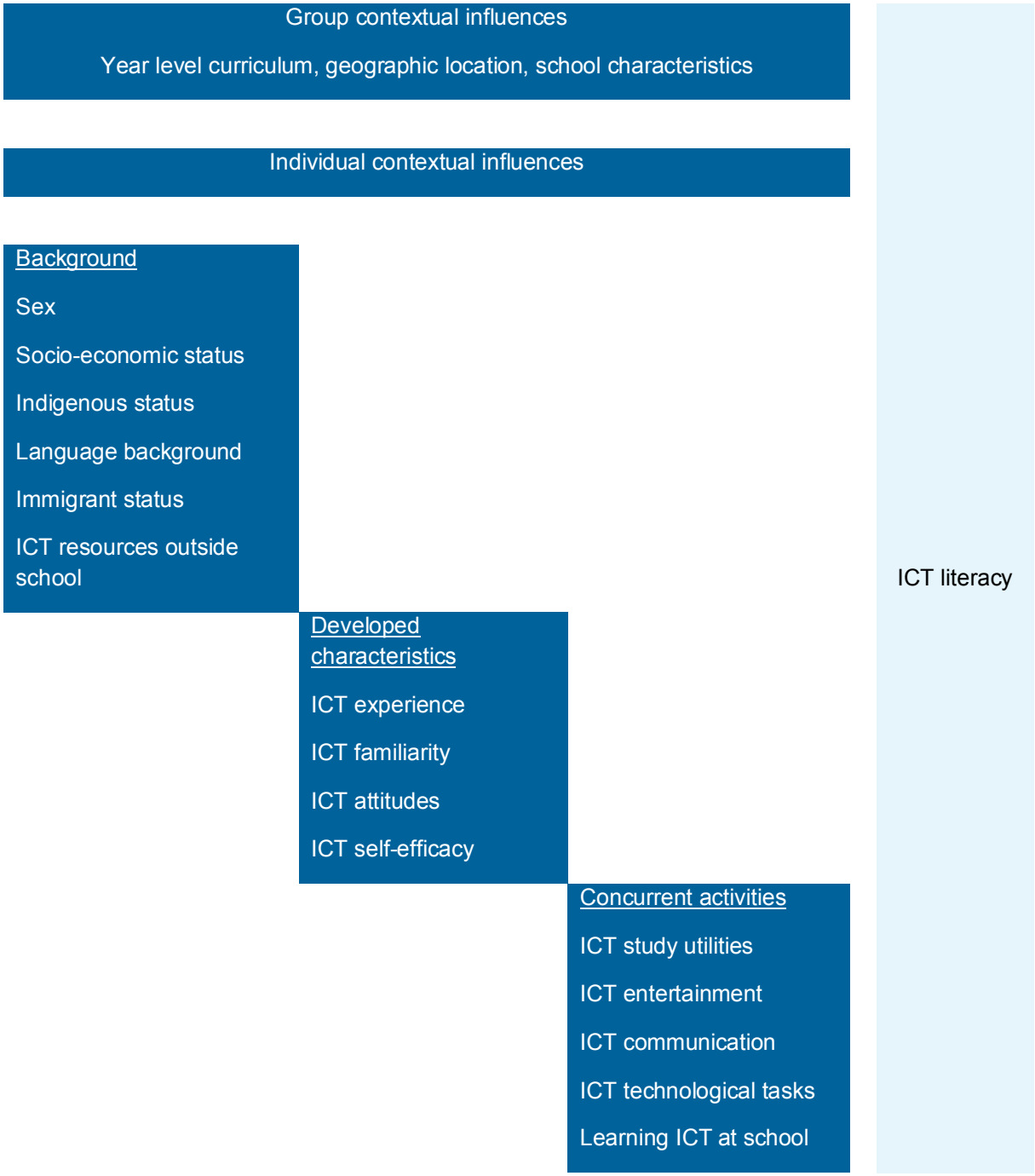
A framework of contextual influences on ICT literacy

Figure 3.1 represents the relationships among the contextual influences on ICT literacy in a diagrammatic form. The diagram follows the convention of representing causality from left to right with the outcome (ICT Literacy) shown on the right-hand

side. Individual contextual influences are shown in blue. Each of these contextual influences (including interactions among these influences) potentially can influence any influence shown to its right in Figure 3.1. Of course, each contextual influence may also influence ICT literacy directly as well as indirectly through other contextual influences. Group contextual influences are shown at the top as overarching influences on ICT literacy and as moderating influences on the relationship between individual characteristics and ICT literacy.

The framework also indicates that analyses might investigate the relationship between a concurrent ICT literacy-related activity and a background characteristic (for example, socio-economic status) or a developed characteristic (for example, ICT experience), or the mediating influence of the developed characteristic on the relationship between the ICT activity and the background characteristic.

Figure 3.1: Framework of contextual influences on ICT literacy



In NAP – ICT Literacy, each of the contextual influences shown in figure 3.1 are measured, analysed and reported as variables. Some contextual influences, such as language background, may be ascribed to a single variable. Some contextual influences, such as ICT self-efficacy, are measured and reported using two types of variables: those variables representing student responses to each question in a set, and scale variables derived from the student responses to the questions in a set as a whole.

3.3 Contextual variables

The NAP – ICT Literacy student survey primarily collects data on contextual variables pertaining to the level of the individual student, including his or her home context. However, it is recognised that some group contextual variables have the potential to affect student ICT learning.

This section includes a summary of key contextual variables included in NAP – ICT Literacy, an indication of the data used to generate measures of those variables and a synopsis of research results concerning relationships between those variables and ICT literacy.

Group contexts

Year level

In every cycle of NAP – ICT Literacy since 2005, students in Year 10 have recorded higher average ICT literacy scores than students in Year 6, with the difference ranging from 107 to 151 scale points, which is equivalent to between 1 and 1,5 standard deviations (ACARA, 2018). Similar findings regarding differences in ICT literacy have been reported for students in the first and third years of secondary school in Korea (Kim & Lee, 2013). There do not appear to be any other large-scale assessments of ICT literacy that have measured the construct at more than one year level.

Geographic location

In NAP – ICT Literacy, geographic location refers to whether a student attended school in a metropolitan, regional or remote area based on the Australian Statistical Geography Standard (ASGS) Remoteness Structure and is collected from system records. In NAP – ICT Literacy 2017, the sample for Year 6 was distributed as 71 per cent metropolitan, 27 per cent regional and 1 per cent remote (ACARA, 2018).[5] The corresponding percentages for Year 10 were almost the same: 71, 28 and 1 per cent. Among Year 6 students, average NAP – ICT Literacy scores were higher for students at metropolitan schools than for those at regional schools (a difference of 41 scale points) and those from remote schools (the difference between regional and remote schools was 45 scale points) (ACARA, 2018). For Year 10 students, the difference between metropolitan and regional schools was smaller (24 scale points) and there was no significant difference between regional and remote schools (this lack of significance is largely a consequence of the small number of remote schools).

System differences

NAP – ICT Literacy does not gather data about characteristics of the educational jurisdictions in Australia. However, international studies have indicated that computer and information literacy, which is an equivalent construct to ICT literacy (see

[5] Some percentages do not add to 100 due to rounding.

de Bortoli et al., 2014), varies across countries, is positively associated with the ICT Development Index and is negatively associated with the average ratio of students to computers in schools (Fraillon et al., 2014). Aesaert et al. (2015) point out that national ICT policies influence school and classroom practice through the curriculum, professional development for teachers, and the provision of resources.

Background characteristics

Socio-economic background

Student socio-economic background in NAP – ICT Literacy is based on data about parental occupation and education collected from schools and school systems (since 2011).[6] In NAP – ICT Literacy 2017, student achievement in ICT literacy was significantly and substantially higher for students with parents in higher occupation groups across both Year 6 and Year 10 (ACARA, 2018). Year 6 and Year 10 students with parents who were senior managers or professionals (30 per cent and 28 per cent for each year level) had NAP – ICT Literacy scale scores that were approximately 70 score points higher than those with parents in the category of unskilled labourers, and office, sales or service staff (14 per cent of students at each year level). A similar pattern had been observed for previous cycles. Similarly, students who had a parent with a bachelor's degree or above (41 per cent of Year 6 and 39 per cent of Year 10) achieved ICT literacy scale scores, on average, more than 60 score points (three-fifths of a standard deviation) higher than other students (ACARA, 2018). This pattern is similar to that found in international studies of computer and information literacy (Fraillon et al., 2019b). Large-scale assessment studies in other countries have also found that higher socio-economic status is consistently associated with higher levels of computer literacy (Claro et al., 2012; Kim et al., 2014; Hatlevik et al., 2015). Aesaert et al. (2015) argue that parental attitudes to and practices with information technology should be considered as part of home environments.

Sex

Data collection in NAP – ICT Literacy adheres to the specifications outlined in the ACARA Data Standards Manual: Student Background Characteristic (ACARA, 2019b). According to the manual, "'Sex' is the distinction 'male' or 'female' as reported by a person" and "'[S]ex' of student is required to report on student performance by male or female" (ACARA, 2019b, p. 14). Prior to 2021, student sex has been categorised as 'female' or 'male'. From 2021, NAP – ICT Literacy can include a category (or categories) in which the sex of a student may be reported as 'other', 'not stated' or 'inadequately described' (ACARA, 2019, p. 14). Across all cycles of NAP – ICT Literacy from 2005 to 2017, female students have recorded

[6] Parent occupations are classified as: senior managers and professionals; other managers and associate professionals; tradespeople and skilled office, sales and service staff; unskilled labourers, and office, sales and service staff; and not in paid work for 12 months. Parental educational attainments are classified as Year 9 or equivalent or below; Year 10 or equivalent; Year 11 or equivalent; Year 12 or equivalent; certificates I–IV (including trade certificates); advanced diploma/diploma; and bachelor's degree or above.

higher average ICT literacy scores than male students in both Year 6 and Year 10 (ACARA, 2018). The difference in achievement of female and male students has remained similar across all five cycles and has been similar for Year 6 and Year 10 students (approximately 18 scale points, which is equivalent to one-fifth of a standard deviation and considered to be a small effect). This result of a difference between female and male students of about one-fifth of a standard deviation has been consistently found in international studies of computer and information literacy (Gebhardt et al., 2019; Fraillon et al., 2019b).

Other national and cross-national assessments of similar constructs to ICT literacy have also found similar results. The ICT content area of the assessment of technological and engineering literacy in the National Assessment of Educational Progress in the United States (NCES, 2016), the Republic of Korea's national assessment of ICT literacy (Kim & Lee 2013; Kim et al., 2014), and a study of upper primary school students in the Netherlands (Aesaert & van Braak, 2015) all found differences between male and female students of about one-fifth of a standard deviation. However, the result is not universal and no significant differences between male and female students were reported in Chile (Claro et al., 2014) and in the senior years in Norway (Hatlevik & Christophersen, 2013). More detailed analyses have suggested that female students perform relatively better on tasks that involve communication and design, and that male students perform relatively better on technical tasks (Gebhardt et al., 2019; Punter et al., 2017). This finding is consistent with the results from ICILS 2018, where female students had higher average scores than male students on computer and information literacy but there were no significant differences on computational thinking (Fraillon et al., 2019b).

Indigenous status

Indigenous status in NAP – ICT Literacy is based on data collected from schools and school systems. Across all cycles of NAP – ICT Literacy, the average ICT literacy achievement was substantially higher for non-Indigenous students (95 per cent of participants) than Indigenous students (5 per cent of participants) at both Year 6 and Year 10 (in the 2017 cycle, the difference was about 100 scale score points for both year levels) (ACARA, 2018).

Language background

Language background in NAP – ICT Literacy is based on data collected from schools and school systems. The differences in NAP – ICT Literacy achievement of students who speak only English at home and those who speak another language at home (22 per cent of Year 6 students and 28 per cent of Year 10 students) were either not significant or small (ACARA, 2018). ICILS 2018 reported that students whose main language at home was the language of the test had higher CIL scores than other students (Fraillon et al., 2019b).

ICT resources outside school

Information about access to digital devices outside school is based on the student survey. In the survey for NAP – ICT Literacy 2021, students are asked to indicate what type of ICT devices (desktop or laptop computer tablet or smartphone) they use

outside school (as well as in school). In NAP – ICT Literacy 2017, about half of Year 6 students and three-quarters of Year 10 students used a desktop or laptop computer outside school and approximately half of students in each of Year 6 and Year 10 used a tablet device (ACARA, 2018) outside of school. In NAP – ICT Literacy 2017, using both a computer and tablet device outside school was associated with much higher ICT literacy achievement than using neither type of device outside school (the difference nearly 100 scale points, or one standard deviation, for both Year 6 and Year 10) (ACARA, 2018). Past cycles of NAP – ICT Literacy have indicated that greater access to ICT resources (for example, home internet connection, the number of computers at home) have been consistently associated with higher levels of ICT literacy (ACARA, 2018). Similar results have been found in international studies of computer and information literacy (Fraillon et al., 2019b) and large-scale assessments of related constructs in other countries (Claro et al., 2012; Kim et al., 2014; Hatlevik et al., 2015).

Developed characteristics

Student experience of digital devices

As part of the student survey, NAP – ICT Literacy 2021 asks students to indicate how long they have been using computers (desktop or laptop) and tablet devices. Over previous NAP – ICT Literacy cycles, student responses to a five-category scale have been reported in terms of a dichotomy: 'at least five years' experience' or 'less than five years' experience'. The percentages of Year 6 students with five or more years' experience of using digital devices has grown from 54 per cent in 2005 to 64 per cent in 2017. The corresponding growth for Year 10 students has been from 64 to 79 per cent (ACARA, 2018). In NAP – ICT Literacy 2017, students with at least five years' experience using digital devices recorded higher average ICT literacy scores than students with less experience at both Year 6 and Year 10 (ACARA, 2018). The difference for Year 10 students (67 points) was greater than the difference for Year 6 students (39 points), but both are moderate size differences. In ICILS 2018, students' experience with ICT for five or more years was consistently and positively associated with computer and information literacy in all countries, with an average net effect of nine scale points (one-tenth of a standard deviation) (Fraillon et al., 2019b).

Frequency of use of digital devices

The student survey for NAP – ICT Literacy 2021 asks students how frequently, at school and outside of school, they use a digital device (desktop computer, laptop computer or tablet device). Five response options range from several times a day to once a week or less. In NAP – ICT Literacy 2017, daily use of a digital device at school was reported by two in five Year 6 students and three in five Year 10 students. The corresponding figures for daily use outside school were three in five Year 6 students and two in three Year 10 students (ACARA, 2018). Year 10 students, who reported using digital devices once a day or more, achieved significantly higher ICT literacy scale scores (by 38 scale points) than those who reported using digital devices less than once a day. There was no difference for Year 6 students. ICILS 2018 reported that Year 8 students' daily use of ICT was consistently and positively associated with computer and information literacy, with an

average net effect of 24 scale points (one-quarter of a standard deviation) (Fraillon et al., 2019b).

Attitudes to ICT

The student survey for NAP – ICT Literacy 2021 asks students to indicate their agreement (from 'strongly disagree' to 'strongly agree') with a set of items concerned with their enjoyment of ICT (such as 'using ICT devices because they help me improve the quality of my work', 'using ICT devices because they make work easier', 'enjoy using ICT devices because they help me to work with others', 'using ICT devices because I prefer to work alone', 'enjoy using ICT devices because they help me communicate with my friends', 'using ICT devices to find new ways to do things, and very important to me to work with an ICT device'). These items are intended to form a scale. In NAP – ICT Literacy 2014 and NAP – ICT Literacy 2011, it was found that, after allowing for the effects of background variables, ICT literacy was significantly associated with interest in, and enjoyment of, using computers (ACARA, 2015). Greater interest in and enjoyment of ICT use were associated with higher CIL scores in a majority of countries in ICILS 2013 (Fraillon et al., 2014).

ICT self-efficacy

In order to measure student self-efficacy, NAP – ICT Literacy 2021 asks students how well they can do a series of tasks on an ICT device (edit digital photographs or other graphic images, create a database, enter data in a spreadsheet, use spreadsheet software to plot a graph, download music from the internet, create a multimedia presentation, use a website editor to create or edit websites, upload files [images, audio/video and text] to a website, post a comment on social media, use a collaborative workspace). Across NAP – ICT Literacy cycles, ICT self-efficacy (how well students felt they could accomplish a range of ICT tasks) is typically higher in Year 10 than Year 6 and higher for males than females. Higher levels of self-efficacy are associated with higher levels of ICT literacy for both female and male students, with correlation coefficients being around 0.25 to 0.30 (ACARA, 2018). In international studies, it appears that ICT literacy is positively associated with ICT self-efficacy related to basic tasks, but not self-efficacy related to specialised tasks (Fraillon et al., 2019b; Rohatgi et al., 2016).

Concurrent activities

ICT applications

NAP – ICT Literacy 2021 asks students to indicate the frequency with which they use various types of ICT applications in and out of school: study utilities, entertainment, communications and technological tasks. The response categories are: 'at least once every day', 'almost every day', 'a few times each week', 'between once a week and once a month', 'less than once a month' and 'never'. These are reported as frequently ('almost every day or more'), occasionally ('between a few times a week and once a month') or rarely ('less than once a month or never'). In order to compare the use of types of applications by different sub-groups of students, scales (based on a mean of 50 and a standard deviation of 10 for Year 6 students) are derived using item response theory, for each of the four application use types:

- Study utilities include searching the internet for information for study or school work; using word processing software or apps to write documents; using spreadsheets to draw a graph or perform calculations; using mathematics, language or other learning programs on a computer; entering data in a spreadsheet; creating presentations for school projects; watching online videos to support learning; organising school work using a learning management system; and recording reflections on learning (for example, through a blog).
- Entertainment applications include watching videos for entertainment; playing video games; using software to create sounds/music, movies, animations or artwork; listening to music or other audio for entertainment; listening to podcasts, audiobooks or internet radio for entertainment; and searching for online information about things of interest.
- Communication activities include emailing, chatting, writing or replying to blogs or forum threads; using voice or video chat to communicate with people online; and creating content with others on social media.
- Technological tasks include writing code, programs or macros; creating programs with a visual coding tool; publishing media on a website; creating or editing a website using a website editor; using drawing, painting or graphics programs; configuring application settings; combining music, video or images to create digital content; posting content on social media; and using a collaborative workspace.

In terms of study utilities, NAP – ICT Literacy has found that more frequent use of productivity applications (such as word processing and spreadsheet applications) was positively associated with achievement, whereas more frequent use of specialist applications (such as concept mapping or simulations and modelling applications) was negatively associated with achievement (ACARA, 2018). Frequency of use of digital devices in general classroom activities was significantly positively associated with achievement, but frequency of use of digital devices in classroom activities requiring specialist software applications was significantly negatively associated with achievement. More frequent school use of ICT for entertainment, communication and technological applications was weakly but negatively associated with ICT literacy (ACARA, 2018).

Learning about ICT at school

In the recent cycles of NAP – ICT Literacy, students were asked to indicate whether they had learnt about a range of aspects of ICT at school: the need to provide references to content from webpages included in schoolwork, the need to know whether they have copyright permission to share music or video, problems of using software to copy or download files for free, checking the origins of a message before opening attachments, changing your password for internet services regularly, reporting spam to an authority, reading licence or usage agreements before clicking 'I agree' to install new software, how to decide where to look for information about an unfamiliar topic, how to look for different types of digital information on a topic, cyberbullying, responsible use of social media, how to protect personal safety when communicating with strangers online, security risks when using the internet, judging

the relevance of information to include in school work and judging whether information on the internet can be trusted. Students responded 'yes' or 'no' to each of the items and percentages indicating 'yes' were reported. In addition, responses to the items were used to derive a scale on students' attribution of ICT learning to school.

In NAP – ICT Literacy 2017, students reported that they were more likely than not to have learnt at school about how to look for different types of digital information on a topic, how to decide where to look for information about an unfamiliar topic and the need to provide references to content from webpages. Topics less frequently learnt included checking the credentials of software patches before downloading and accepting, and using software to find and get rid of viruses (ACARA, 2018). A significant but weak association was found between attributing ICT learning to school teaching and achievement at Year 6, but no association was found at Year 10 (ACARA, 2018). A similar result was found in ICILS 2018 with a small but significant association between computer and information literacy scores and attributing ICT learning to school teaching in ten out of 14 countries (Fraillon et al., 2019b).
NAP – ICT Literacy 2021 includes variables associated with students' reported experience of learning about tasks associated with the AC: ICT Capability and the AC: Digital Technologies.

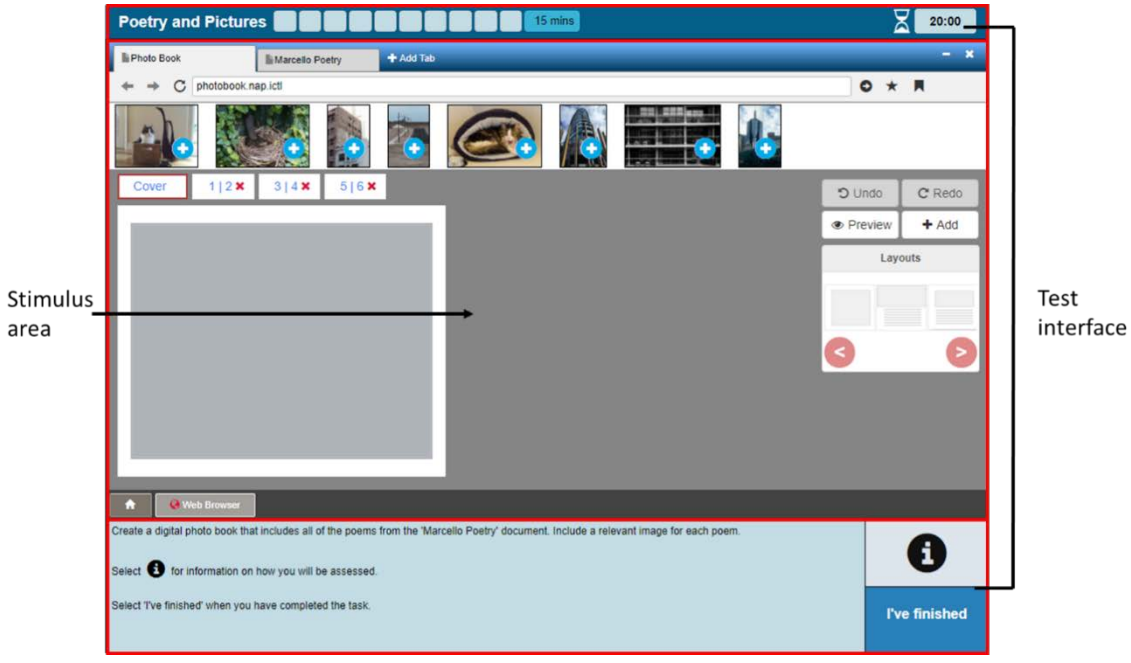
4 NAP – ICT LITERACY INSTRUMENTS

4.1 Test instrument overview

The NAP – ICT Literacy assessment is computer-based and provides students with an authentic representation of a *typical* computer environment, limited by some functional restrictions to ensure that the test-taking experience is consistent across students. The authenticity of the environment is achieved by using purpose-built applications that adhere to standard interface design and user experience conventions. The NAP – ICT Literacy assessment is accessible online via a web browser or can be delivered from a USB in cases where access to the internet is limited.

Students are presented with a variety of assessment tasks grouped and presented in modules that follow a linear narrative sequence and are designed to reflect students' typical 'real-world' use of ICT. The modules include a variety of task types including multiple choice and short text response questions, skill execution tasks, and digital information literacy and communication tasks. Students complete tasks using a range of software applications, including productivity and communications applications (such as collaborative workspaces, design tools and word processing and presentation software applications). Students also engage with web-based information resources. The web content is developed for exclusive use in the NAP – ICT Literacy assessment. Students can only access the web content developed for the assessment with a simulated web browser that accesses and displays websites in a closed web environment. The assessment platform allows students to navigate the test content and respond to the assessment tasks. The on-screen test environment includes two functional areas that are independently interactive: the test interface and the stimulus area (see Figure 4.1).

Figure 4.1: Test environment comprising two functional areas



4.2 Test interface

In order to provide a consistent testing experience for all students, the screen layout and test environment are predefined and are uniform. The screen layout includes an outer static border that houses test information for students, such as the name of the module they are completing, the time remaining and their progress through the tasks in that module. At the bottom of the screen, there is a section containing the task instructions or questions for students to complete, and a large central space (stimulus) in the screen contains the dynamic information or software that students use to answer questions and complete tasks. The stimulus contains either non-interactive content, such as the text of an email from a collaborator on a task, or interactive content, such as electronic documents or live software applications. The test interface includes navigation controls that allow students to move between tasks, and an information button that allows students to access general test-taking information and task specific information, such as scoring criteria or detailed task instructions.

Students are not able to exit the test environment during the test, nor are they able to progress beyond the end of each individual module without the assistance of the test administrator.

New for NAP – ICT Literacy 2021 is the facility for students to have questions and instructions read to them using embedded audio files. This feature is available for questions and instructions in the test modules and for the student survey.

4.3 Test instrument design

NAP – ICT Literacy consists of test modules made up of individual tasks. Each student completes four modules and is allocated up to 20 minutes to complete each module. This time is controlled automatically by the online testing system. In each cycle since the inaugural assessment in 2005, the test instrument has included a selection of modules from previous assessment cycles and some modules, newly developed for the current cycle. This combination of previously used and newly developed modules allows for student achievement to be measured and reported against the NAP – ICT Literacy achievement scale established in 2005 and for the NAP – ICT Literacy assessment content to remain up to date with changes in ICT technology and ICT use over time.

In total, there are eight test modules in the NAP – ICT Literacy 2021 test instrument. Three of these modules are secure modules carried over from previous cycles of NAP – ICT Literacy (one that was developed in 2014, and two that were developed in 2017). Five new modules were developed for use in NAP – ICT Literacy 2021.

The content of the three secure modules was developed with reference to the NAP – ICT Literacy construct used from 2005 to 2017, and the content of the five new modules represents the revised NAP – ICT Literacy 2021 construct. While there is considerable congruence between the previous and the revised NAP – ICT Literacy constructs, the two vary in particular when considering their relevance to the AC: Digital Technologies. In order to both maintain consistency with past cycles of NAP – ICT Literacy and to integrate the new content for

NAP – ICT Literacy 2021, two new test modules were developed with a focus on the aspects of the NAP – ICT Literacy 2021 construct that correspond to the AC: ICT Capability, and three new modules were developed to focus on content that corresponds to the AC: Digital Technologies.

The three secure modules from previous cycles of NAP – ICT Literacy and two of the newly developed modules emphasise the following aspects of the NAP – ICT Literacy 2021 construct:

- 1.1 Managing information and operating ICT
- 2.1 Accessing and evaluating information
- 3.1 Communicating with digital information products
- 4.1 Safe and responsible information consumption with ICT
- 4.2 Responsible digital solutions and information production with ICT.

Three of the five newly developed modules emphasise the following aspects:

- 1.2 Understanding digital systems
- 2.2 Collecting and representing data
- 2.3 Formulating problems and planning solutions
- 3.2 Developing algorithms, programs and interfaces.

Data collected from all eight modules in the NAP – ICT Literacy 2021 are used as the basis for reporting test results on the NAP – ICT Literacy achievement scale established in 2005.[7] All students complete four of the eight available modules in a balanced rotation. The rotated module design for the modules enables the instrument to contain and consequently report on achievement against a larger amount of content than any single student could reasonably complete in 80 minutes.

4.4 Test modules

Each module has a single unifying theme. The modules begin with a number of simulated performance tasks, multiple-choice and short constructed-response questions, and conclude with a single integrated task using at least one live software application, in which students produce a final digital solution. The digital solutions may be in the form of an information product (such as a presentation, a poster, or an animated video) or a programmatic solution to a problem (such as an algorithm or simulation results).

[7] Broadening the NAP – ICT Literacy construct and test to include content that is congruent with the AC: Digital Technologies may lead to the results of NAP – ICT Literacy being reported on a new achievement scale in addition to the NAP – ICT Literacy scale developed in 2005. The viability of reporting more than one scale for NAP – ICT Literacy 2021 can only be determined following collection and analyses of data in the NAP – ICT Literacy main survey in late 2021.

Initial tasks

Typically, the initial 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). Within each module, the questions and tasks follow a narrative sequence in which information is typically collected and developed in preparation for the final task. As a consequence of this, many later tasks in each module contain information that could be used to answer or complete earlier tasks.

For example, in one module, students are presented with a simple report on web traffic, which shows the number of visits to a small set of webpages for two different time periods. Students are first required to use the information in the report to identify the webpage that has had a large reduction in visits across the two time periods. In the next task, students are asked to locate and examine the previously identified webpage to explain the reduction in visits. In this second task, the webpage that needs to be reviewed (that is, the one with a reduction in visits) is identified for the students so that they can evaluate its contents. This allows students who had not correctly identified the site from the website traffic report still to analyse the content of the site to explain why the traffic may have been reduced. However, it also provides students with the correct answer to the previous task. In order to prevent students from returning to earlier tasks to correct errors they later realise they have made, students have to complete all tasks and questions in each module in the narrative sequence provided to them in the module. Students are not able to move back to previous tasks once they have completed them.

Digital solution tasks

The information product tasks are specified for students in terms of the software tools and format to be used (and consequently the format of the product), the communicative purpose, and the target audience of the information product. Students are also provided with information about the criteria that will be used to assess each large task. The programmatic problem-solving tasks provide students with a visual coding interface or simulation software with adjustable parameters. The modules are designed to reflect students' typical 'real-world' use of ICT and digital systems, and include a range of school-based and out-of-school-based themes that are driven by plausible narratives.

Module themes

The module themes are selected to be engaging and relevant to students, and the tasks are developed with a view to preventing prior content knowledge relating to a module theme from advantaging subgroups of students. This is achieved in two main ways. First, any contextual, subject-based information students need to manage the tasks is provided to students within the tasks. Second, any content presented to students (such as scientific or technical information) is not more complex than the level of knowledge and understanding reasonably expected of students two year levels below the year of the students completing the tasks.

Response formats

The tasks include a broad range of response formats including:

- multiple choice
- drag and drop (matching information)
- simple software commands (such as saving a file to a location)
- short constructed text responses
- construction of information products
- development of algorithms
- simulation experiments.

Some tasks are automatically scored, while other tasks that produce responses stored as text, including the information products, are marked by trained markers. Sample tasks are provided in section 4.5: Types of assessment task. Example test modules from previous NAP – ICT Literacy assessment cycles can be downloaded from the National Assessment Program website at: www.nap.edu.au/nap–sample–assessments/school–support.

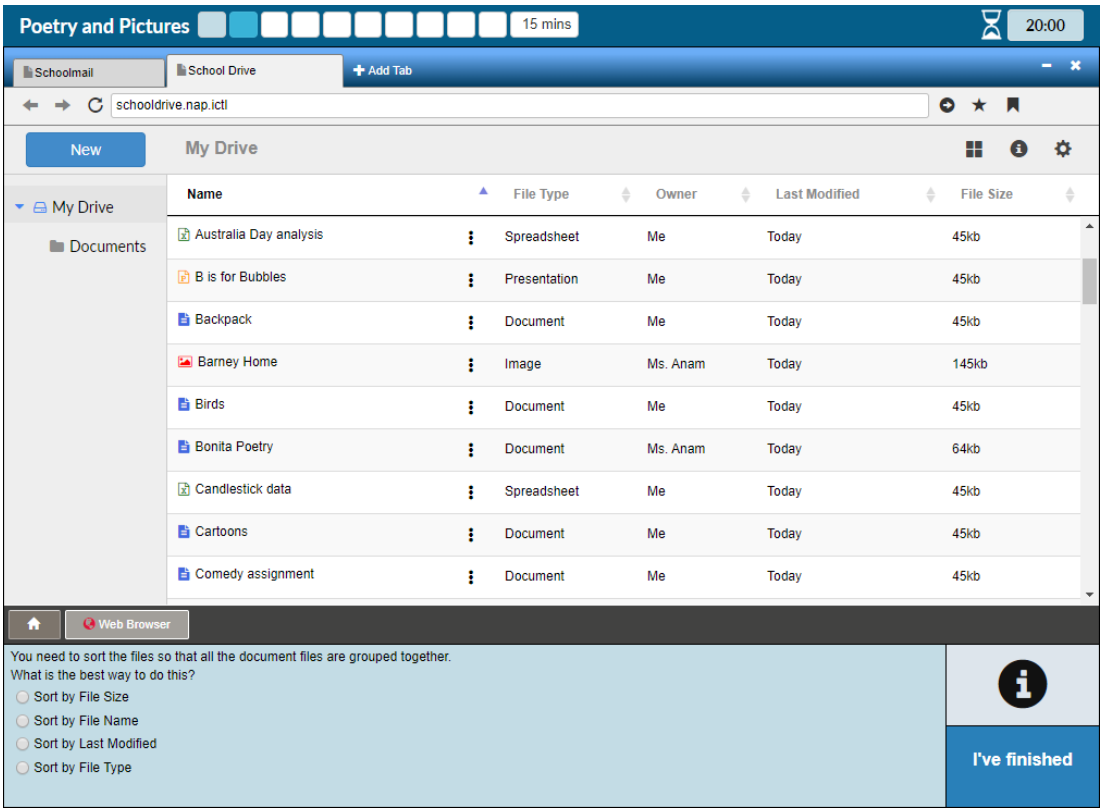
4.5 Types of assessment tasks

Following are descriptions of the different types of assessment tasks used in the NAP – ICT Literacy assessment. The classification of the task types draws on that used to describe the assessment content in the International Computer and Information Literacy Study (ICILS) (see, Fraillon et al., 2019a).

Task type 1: Information-based response tasks

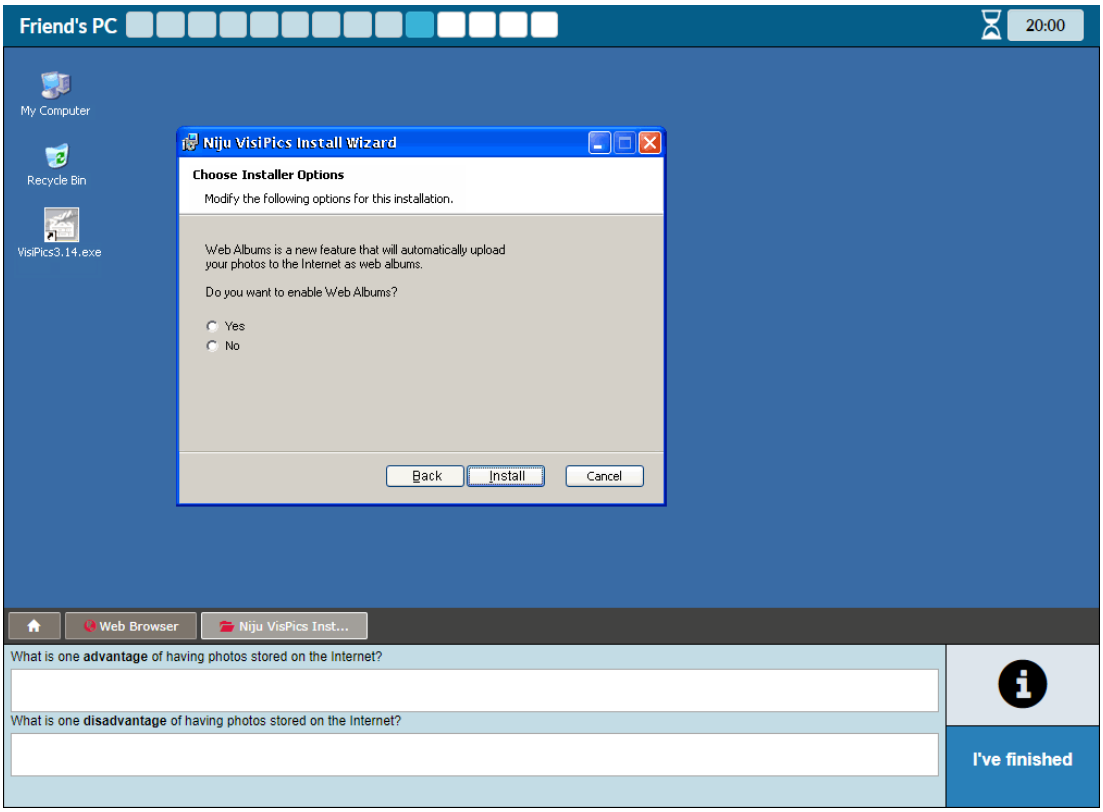
Information-based response tasks use multiple-choice, short constructed text response and drag-and-drop formats. The stimulus is typically a non-interactive representation of an electronic information source, computer-based scenario or digital system. These tasks are used to assess student knowledge and understanding of specific ICT literacy concepts and to allow students to provide analysis of information (such as to make a judgement about the apparent trustworthiness of information on a webpage), evaluate a scenario (such as identifying the advantages of a software program's features) or demonstrate an understanding of the algorithmic rules that underpin a digital system. This knowledge and understanding of ICT literacy concepts are captured independently of students using anything beyond the most basic skills required to record a response. All multiple-choice and drag-and-drop tasks are automatically scored and students' short constructed responses are stored as text for later marking by trained markers.

Figure 4.2: Example task 1 (a typical multiple-choice task)



Illustrating an information-based response task, example task 1 (Figure 4.2) presents students with a question about how to group document files together. The stimulus shows a typical web-based file storage service with a variety of file types sorted by name, which is a real-world scenario that helps to contextualise the question. The task relates to aspect 1.1, managing information and operating ICT.

Figure 4.3: Example task 2 (a typical short constructed text response)



The stimulus material in example task 2 (Figure 4.3) presents students with a photo management application installer. The installer prompts the user to enable the storage of photos on the internet and students are asked what one advantage is and one disadvantage is of storing photos on the internet. This task relates to aspect 1.2, understanding digital systems.

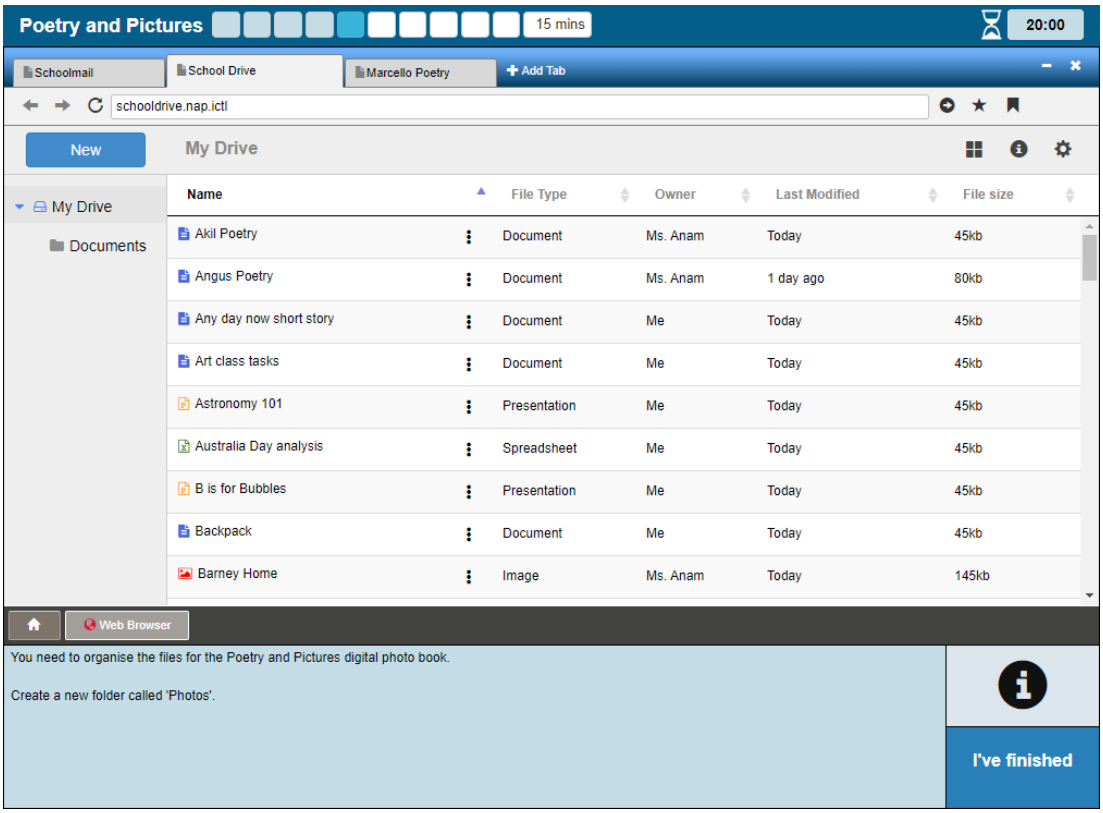
Task type 2: Skills tasks

The NAP – ICT Literacy assessment includes both linear and nonlinear skills tasks (Fraillon et al., 2019a). Linear skills tasks "can only be completed correctly if the commands are executed in a necessary prescribed sequence" (Fraillon, et al., 2018, p. 48). In NAP – ICT Literacy, linear skills tasks were designed to capture data on whether students were able to complete a task at that point in time without support or assistance. These simulated software application tasks can be considered as assessing whether students 'know' the function they are being asked to execute. The skills tasks consist of software simulations that automatically capture and score student responses.

The tasks simulate normal functionality up until the point at which a student executes a function or sequence of commands. At this point, students are presented with a screen stating that 'Your response has been recorded', along with the option for students to 'Try again' once or go to the next task. For example, if a student is asked to cut a section of selected text, when the student executes a command, the 'Your response has been recorded' screen appears rather than the text disappearing from the screen where they have executed the command. In normal circumstances, the student would know whether or not they have executed the cut command accurately

by seeing the selected text disappear from the screen. As such, students would be able to use a trial-and-error approach to executing the desired skill. Because the linear skills tasks were designed to capture point-in-time knowledge, the simulations do not provide students with any feedback about their success. Students can select 'Try again' once with each skills task (in case they are not sure whether they executed the function correctly) and after a second attempt are required to move to the next task. Students receive full credit on skills tasks for correctly executing them by any conventional method (typically by using keyboard shortcuts, icons/buttons or drop-down menus).

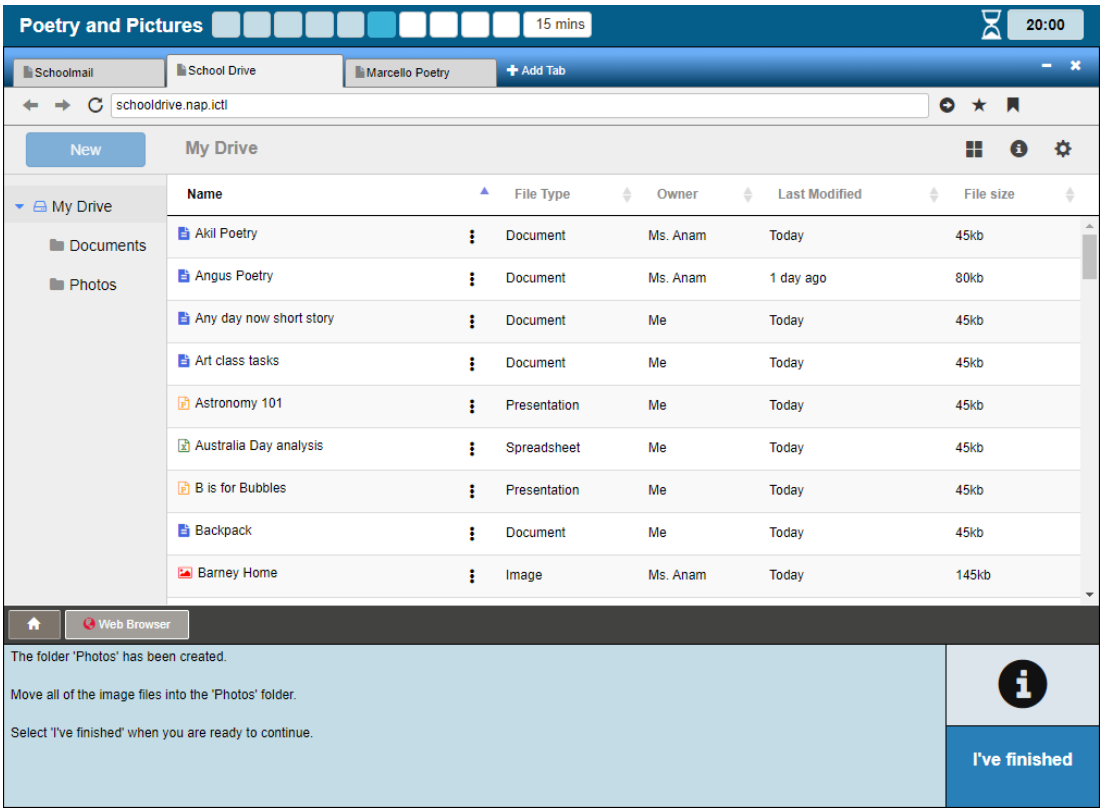
Figure 4.4: Example task 3 (linear skills task)



Example task 3 (Figure 4.4) provides an example of a linear skills task that requires students to use the interface of a web-based file storage system to create a new folder called 'Photos'. Students must first click the 'New' button in the top left part of the interface, which displays a context menu. Students must then choose 'Folder' and enter the name 'Photos' to correctly name the new folder. Example task 3 relates to aspect 1.1, managing information and operating ICT.

In nonlinear skills tasks, students are required to "execute a software command (or reach a desired outcome) by executing subcommands in a number of different sequences" (Fraillon, et al, 2018, p. 48). In NAP – ICT Literacy, like linear skills tasks, nonlinear skills tasks present simulated software applications. However, unlike linear skills tasks, they do not have any endpoints that display the action recorded message. Instead, students must evaluate the quality and completeness of their actions before progressing to the next task.

Figure 4.5: Example task 4 (nonlinear skills task)



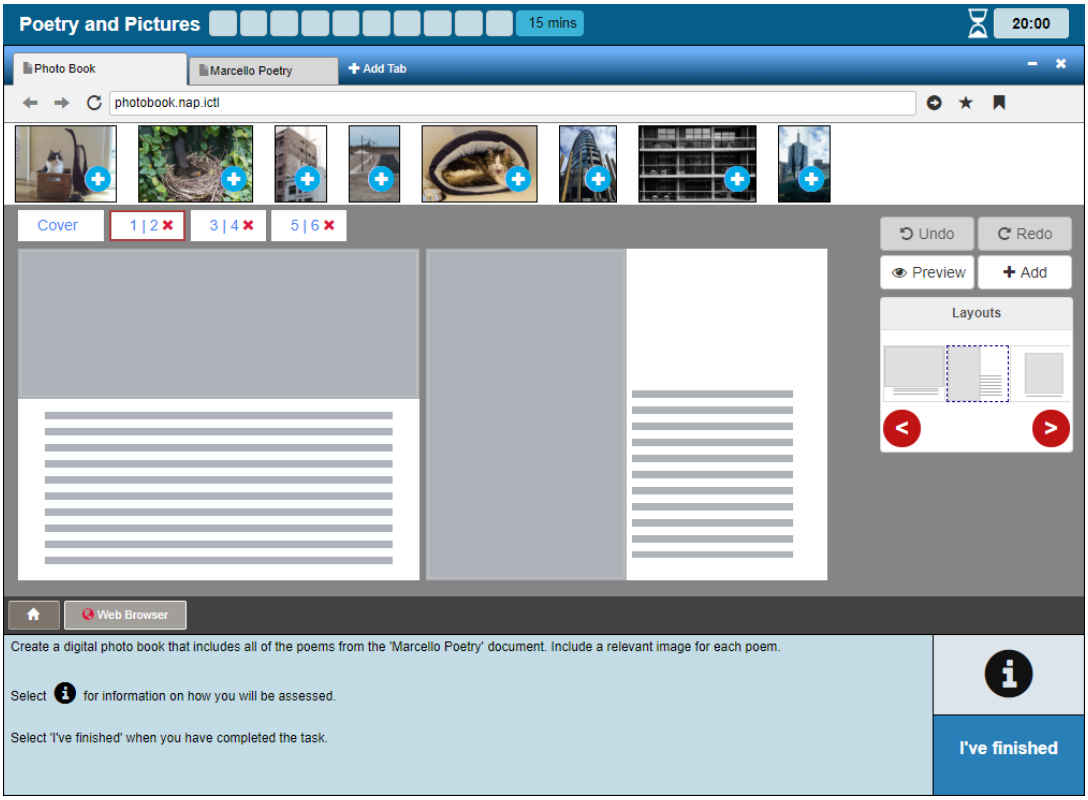
Example task 4 (Figure 4.5) illustrates a nonlinear skills task. This task requires students to move multiple image files into a folder. The files are sorted by name by default, which means the image files that need to be moved are not grouped together. The total number of files in the folder makes it difficult to find the image files with ease. The simulated web-based file storage system is designed to function like live software. Students can scroll the list of files and move each image file one by one into the 'Photos' folder using drag and drop or a right click context menu. They can also use the column headings to sort the files by type, which groups the image files together. All of the image files can then be more easily selected and moved to the 'Photos' folder in two steps. If students accidently move the wrong file into the folder, they can open the folder and move it back to the root folder. Student responses are scored automatically, with the highest level of credit given to students who make use of the sorting function and move *only* the seven images files to the correct folder. Students who move all of the images files without sorting the files by type receive less credit.

Nonlinear skills tasks may also be presented as configuration tasks in which students alter settings that affect the operation of a given application. Examples of these tasks that students may complete are: personalising the look and feel of an application, granting a user access to a collaborative workspace or file, modifying the margin properties of a document page and configuring parameters that define how a simulation is conducted.

Task type 3: Authoring tasks

Authoring tasks require students to "modify and create information products using authentic computer software applications" (Fraillon, et al, 2018, p. 49). In NAP – ICT Literacy, authoring tasks are larger communication tasks that are completed using 'live' software applications, such as word processors, presentation software and spreadsheets; simple web-based databases and survey design software; and some adapted graphics and multimedia applications. Unlike the skills tasks, the authoring tasks avail students of the full set of real-time feedback and functionality of the live software applications. When completing the authoring tasks, students typically need 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 an authoring task. Students are free to manage their own time during each module. However, they are advised to allow half of the time allocated in each module to complete the larger authoring tasks.

Figure 4.6: Example task 5 (authoring task)



Example task 5 (Figure 4.6) illustrates an authoring task that requires students to use a digital photo book application to assemble a book of poems accompanied by photos. The task requires students to navigate between the photo book application and a document that contains poems. They can copy and paste information between the applications. Consequently, students must integrate information across the two applications to complete the task. They can also adjust the page layouts using pre-defined templates that determine the visual relationship of the image container and textbox. Some images are tall while others are wide, which means some layouts are

more suitable than others. Students must decide which layouts to use to best present the information.

The information products (such as documents, spreadsheets, presentations, graphics/multimedia) are saved and scored by trained markers using criterion-based scoring rubrics. While the exact criteria within each rubric vary depending on the task requirements, for most authoring tasks, the criteria relate to the way in which students have used the available information and software features to complete the tasks. Criteria relating to students' use of information typically refer to the relevance of the information students have selected from the sources, the organisation of information in the information product, and the appropriateness with which students have adapted the source to suit the target audience and purpose. Criteria relating to students use of the software features (such as formatting, colour, layout and resizing) have a strong focus on the intended communicative purpose of the information product. In most cases, the scoring hierarchy within each criterion relates to the use of software features and to the degree with which the feature has been used in a way that supports or enhances the communicative intent of the information product.

Task type 4: Visual coding tasks

The visual coding tasks in NAP – ICT Literacy use a specialised user interface modelled on popular visual coding applications. Fundamental to these environments is the use of drag-and-drop code blocks to specify commands and a visual representation of the result of implementing a given set of commands. The represented context for a visual coding task could be simple line graphics, a series of on/off switches, an avatar that moves across a grid or a user interface with buttons and elements controlled by the use of the buttons. In these examples, the code blocks are used to draw the lines, activate/deactivate switches, control the movement of the avatar and define the behaviour of elements controlled by the buttons.

The interface includes a space containing the code blocks that can include action statements (for example, 'change background'), conditionals (for example, 'if do', 'if else'), comparison operators (for example, 'greater than', 'equal to') and logical operators (for example, 'AND', 'OR', and 'NOT').

The interface also includes a workspace where the code blocks can be placed, ordered and reordered or removed from the workspace. Code blocks in the workspace can be executed, which can affect various elements presented in a visually represented context. Students are given an objective that relates to the state of the visually represented context. They can work iteratively by adding, removing and reordering code blocks to the workspace and executing the algorithm to see and evaluate the results.

4.6 Mapping test items to the NAP – ICT Literacy construct

Each individual task in NAP – ICT Literacy is mapped to the strands and aspects of the NAP – ICT Literacy construct. The allocation of items and score points from the NAP – ICT Literacy 2021 test instrument is shown below (Table 4.1).

Table 4.1: Mapping of NAP – ICT Literacy assessment items to the NAP – ICT Literacy construct

ICT Literacy strand/aspect	Total (items)[1]	Maximum total (score points)[2]
Strand 1: Understanding ICT and digital systems		
Aspect 1.1: Managing information and operating ICT	36	37
Aspect 1.2: Understanding digital systems	6	7
Total (strand 1)	**42**	**44**
Strand 2: Investigating and planning solutions with ICT		
Aspect 2.1: Accessing and evaluating information	18	18
Aspect 2.2: Collecting and representing data	8	15
Aspect 2.3: Formulating problems and planning solutions	10	15
Total (strand 2)	**46**	**48**
Strand 3: Implementing and evaluating digital solutions		
Aspect 3.1: Producing digital information products	24	27
Aspect 3.2: Developing algorithms, programs and interfaces	6	6
Total (strand 3)	**30**	**33**
Strand 4: Applying safe and ethical protocols and practices when using ICT		
Aspect 4.1: Safe and responsible information consumption with ICT	3	5
Aspect 4.2: Responsible digital solution and information production with ICT	3	4
Total (strand 4)	**6**	**9**

4.7 Learning progression described in NAP – ICT Literacy

The NAP – ICT Literacy scale was established based on the test contents and psychometric data collected during the inaugural NAP – ICT Literacy assessment in 2005. The scale comprises six achievement levels that are used to describe the achievement of students in both Year 6 and Year 10. The scale descriptors have been reviewed following each subsequent cycle of NAP – ICT Literacy to ensure the accurate reflection of the NAP – ICT Literacy test contents. The descriptors will again be reviewed following NAP – ICT Literacy 2021 to integrate and represent the new

assessment content developed with respect to the revised NAP – ICT Literacy construct.

The NAP – ICT Literacy scale describes achievement from the performance of very basic skills through to high-level information literacy evidenced in sophisticated receptive and productive communication of digital information. The complete NAP – ICT Literacy scale has been included as appendix 1. Following is a brief summary of student achievement across the six levels of the scale.

Students working at Level 1 perform basic tasks using computers and software, such as simple editing of text and resizing or moving graphics in documents or executing generic commands, such as 'copy' and 'paste', when directed. In 2017, 13 per cent of Year 6 students and 3 per cent of Year 10 students nationally were performing at Level 1 (ACARA, 2018).The difference between working at Level 1 and higher levels relates to the breadth of tasks students are able to complete and, more importantly, to the degree to which students are able to initiate searches for information and edit digital information.

Students working at Level 2 locate simple explicit information from within a given electronic source. They add content and make simple changes to existing information products when instructed. In 2017, 33 per cent of Year 6 students and 10 per cent of Year 10 students nationally performed at Level 2 (ACARA, 2018). A common aspect of students working at levels 1 and 2 is that they complete tasks with high levels of structure and support. A key difference between achievement at Level 2 and higher levels is the level of autonomy that students demonstrate in executing skills to complete tasks.

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. At this level, students are able to execute a range of information sourcing and editing commands independently, but these are in response to clear task requirements. Students are aware of potential misuse of ICT and, at this level, are aware of some ways of protecting against misuse. In 2017, 41 per cent of Year 6 students and 33 per cent of Year 10 students nationally performed at Level 3 (ACARA, 2018). A key difference between students working at Level 3 and higher levels is their capacity to plan to complete information literacy tasks, rather than simply follow instructions about how to complete tasks. Students at higher levels also show awareness of audience and purpose in their planning and execution of communicative tasks.

Students working at Level 4 generate well-targeted searches and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures 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. In 2017, 13 per cent of Year 6 students and 46 per cent of Year 10 students nationally performed at Level 4 (ACARA, 2018). A key difference between students achieving at Level 4 and higher levels is the degree to which students show awareness of communicative conventions (such as layout conventions) as they complete tasks.

Students performing at higher levels demonstrate more precise control of software tools and strategies when searching for, evaluating and communicating information.

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. 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. Students achieving at these highest levels demonstrate the knowledge and skills to search for, create and communicate using ICT in ways that target purpose and audience. The efficiency and polish of work evidencing Level 6 achievement is obtained through careful planning and review with reference to the purpose of the work. In 2017, less than one per cent of Year 6 students performed at levels 5 and 6 combined, eight per cent of Year 10 students performed at Level 5 and less than one per cent of Year 10 students performed at Level 6 (ACARA, 2018). Clearly these highest two levels represent sophisticated and challenging proficiency.

As discussed earlier, the NAP – ICT Literacy 2021 scale will be revised with reference to the broadened NAP – ICT Literacy 2021 construct and the consequent broadening of the content of the assessment to better incorporate outcomes associated with the AC: ICT Capability and the AC: Digital Technologies.

4.8 The NAP – ICT Literacy student survey

The NAP – ICT Literacy student survey serves to collect data relevant to the contextual framework (see chapter 3).

In NAP – ICT Literacy, student background data are collected from schools and school systems. These data are student year level (Year 6 or Year 10); the state and territory in which they attend school; the geographic location of the school; students' sex, Indigenous status, language background and the occupation and highest level of education of students' parents.

The NAP – ICT Literacy student survey collects data on other contextual information related to ICT literacy: access to ICT resources, experience of using ICT, use of ICT outside of school and at school and attitudes to ICT.

The student survey contains questions to generate data reflecting the following aspects of ICT use and attitudes related to ICT:

- how long students have been using ICT devices
- what ICT devices students use at school and outside of school
- whether students use portable ICT devices at school and how they are provided
- how often students use ICT devices at school and outside of school
- students' attitudes about the importance of ICT use

- students' confidence to complete tasks using ICT
- how often students use a range of ICT study utilities at school and outside of school
- how often students use entertainment applications on ICT at school and outside of school
- how often students use communication applications on ICT at school and outside of school
- how often students complete technological tasks on ICT at school and outside of school
- students' reported experience of learning about ICT issues at school
- students' participation in ICT-related learning activities at school
- how often students use ICT tools for school-related purposes.

REFERENCES

Australian Curriculum and Reporting Authority (ACARA) (2012a). *Australian Curriculum: Information and Communication Technology (ICT) capability*. Available at: www.australiancurriculum.edu.au/f–10–curriculum/general–capabilities/information–and–communication–technology–ict–capability/

Australian Curriculum and Reporting Authority (ACARA) (2012b). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2011.* Available at: www.nap.edu.au/_resources/NAP_ICTL_2011_Public_Report_Final.pdf

Australian Curriculum and Reporting Authority (ACARA) (2015a). *Australian Curriculum: Digital Technologies*. Available at: www.australiancurriculum.edu.au/f–10–curriculum/technologies/digital–technologies

Australian Curriculum and Reporting Authority (ACARA) (2015b). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2014.* Available at: www.nap.edu.au/_resources/D15_8761__NAP–ICT_2014_Public_Report_Final.pdf

Australian Curriculum and Reporting Authority (ACARA) (2018). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2017.* Available at: www.nap.edu.au/docs/default–source/default–document–library/2017napictlreport_final.pdf?sfvrsn=2

Australian Curriculum and Reporting Authority (ACARA) (2019a). *Measurement Framework for Schooling in Australia 2019*: Available at: www.acara.edu.au/reporting/measurement–framework–for–schooling–in–australia

Australian Curriculum and Reporting Authority (ACARA) (2019b). *Data Standards Manual: Student Background Characteristics. 2019 edition*: Available at: www.acara.edu.au/docs/default-source/default-document-library/2019-revisions-data-standards-manual-student-background-characteristicsfb2913404c94637ead88ff00003e0139.pdf?sfvrsn=0

Aesaert, K., van Nijlen, D., Vanderlinde, R., & van Braak, J. (2014). Direct measures of digital information processing and communication skills in primary education: Using item response theory for the development and validation of an ICT competence scale. *Computers & Education*, 76, 168–181. Available at: https://doi.org/10.1016/j.compedu.2014.03.013.

Aesaert, K., van Braak, J., van Nijlen, D., & Vanderlinde, R. (2015). Primary school pupil's ICT competences: Extensive model and scale development. *Computers & Education*, 81, 326–344. Available at: https://doi.org/10.1016/j.compedu.2014.10.021.

Claro, M., Preiss, D., San Martin, E., Jara, I., Hinostraoza, J. E., Valenzuela, S., Cortes, F., & Nussbaum, M. (2012). Assessment of 21st century ICT skills in Chile: Test design and results from high school level students. *Computers and Education*, 59, 1042–1053. Available at: https://doi.org/10.1016/j.compedu.2012.04.004.

Curriculum Corporation (2006). Statements of Learning for Information and Communication Technologies (ICT). Availableat : www.curriculum.edu.au/verve/_resources/SOL06_ICT.pdf

Education Council (2019). *Alice Springs (Mparntwe) Education Declaration*. Available at: https://docs.education.gov.au/documents/alice–springs–mparntwe–education–declaration

De Bortoli, L., Buckley, S., Underwood, C., O'Grady, E., & Gebhardt, E. (2014). ICILS 2013: Australian students' readiness for study, work and life in the digital age. Melbourne: ACER. Available at: http://research.acer.edu.au/ict_literacy/6.

Fraillon, J., Ainley, J., Schulz, W., Duckworth, D., & Friedman, T. (2019a). *IEA International Computer and Information Literacy Study 2018 assessment framework.* Cham, Switzerland: Springer. Available at: www.springer.com/gp/book/9783030193881.

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth D. (2019b). *Preparing for Life in a Digital World: IEA International Computer and Information Literacy Study* 2018 Final Report. Cham, Switzerland: Springer.

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). *Preparing for life in a digital age: The IEA International Computer and Information Literacy Study international report*. Cham, Switzerland: Springer. Available at: www.springer.com/gp/book/9783319142210.

Gebhardt, E., Thomson, S., Ainley, J. & Hillman, K. (2019). Gender Differences in Computer and Information Literacy: An In-depth Analysis of Data from ICILS. Amsterdam: International Association for Educational Achievement (IEA).

Hatlevik, O.E., & Christophersen, K.A. (2013). Digital competence at the beginning of upper secondary school: Identifying factors explaining digital inclusion. *Computers & Education*, 63(1), 240–247. Available at: https:/doi.org/10.1016/j.compedu.2012.11.015.

Hatlevik, O., Ottestad, G., & Throndsen, I. (2015). Predictors of digital competence in 7th grade: A multilevel analysis. *Journal of Computer Assisted Learning*, 31, 220–231. Available at: https://onlinelibrary.wiley.com/doi/10.1111/jcal.12065.

Kim, J., & Lee, W. (2013). Meanings of criteria and norms: Analyses and comparisons of ICT literacy competencies of middle school students. *Computers & Education*, 64, 81–94. Available at: https://doi.org/10.1016/j.compedu.2012.12.018.

Kim, H. S., Kil, H. J., & Shin, A. (2014). An analysis of variables affecting the ICT literacy level of Korean elementary school students. *Computers & Education*, 77, 29–38. Available at: https://doi.org/10.1016/j.compedu.2014.04.009.

Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (2005). National Assessment Program – Information and Communication Technology Literacy 2005 Years 6 and 10. An Assessment Domain for ICT literacy. Available at: www.iste.org/docs/pdfs/australia_ict_assessment.pdf?

Ministerial Council on Education, Early Childhood Development and Youth Affairs (MCEETDA) (2009). *National Assessment Program – ICT literacy Years 6 & 10 Report 2008.* Available at: www.nap.edu.au/_resources/2008_NAP_ICTL_Public_Report.pdf

Punter, R., Meelissen, M., & Glas, C. (2017). Gender differences in computer and information literacy: An exploration of the performances of girls and boys in ICILS 2013. *European Educational Research Journal*, 16(6), 762–780. Available at: https://journals.sagepub.com/doi/10.1177/1474904116672468.

Rohatgi, A., Scherer, R., & Hatlevik, O. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers & Education*, 102, 103–16.

US Department of Education, National Assessment Governing Board (NAGB). (2018). Technology & Engineering Literacy Framework for the 2018 National Assessment of Educational Progress. Washington, DC: National Assessment Governing Board. Available at: www.nagb.gov/content/nagb/assets/documents/publications/frameworks/technology/2018-technology-framework.pdf

US Department of Education, National Center for Education Statistics (2016). The nation's report card: 2014 Technology & Engineering Literacy (TEL) report card at grade 8 (NCES2016119). Available at: www.nationseportcard.gov/tel_2014/.

US Department of Education, National Center for Educational Statistics (NCES). (2016a). 2014 Abridged technology and engineering literacy framework for the 2014 National Assessment of educational progress. Washington, DC: National Assessment Governing Board.

APPENDIX 1

Table A1: NAP – ICT Literacy 2017 proficiency level descriptors with examples

Proficiency level	Proficiency level description	Examples of student responses
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
Level 5	Students working at Level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products. They employ file management practices to support workflow management when creating 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 • Use video/animation editing techniques to control the timing of events and transitions to create a sense of continuity • 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 moving and organising image files into a dedicated folder for the purpose of importing the images into an application • Explain the advantages and disadvantages of saving documents as PDFs

Table A1: NAP – ICT Literacy 2017 proficiency level descriptors with examples (cont.)

Proficiency level	Proficiency level description	Examples of student responses
Level 4	Students working at Level 4 generate well-targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this	• Create an information product in which the flow of information is clear and the tone is controlled to suit a specified audience • Generate searches that target relevant resources, apply search engine filtering parameters to improve search results 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 specialised file management and software functions, such as sorting files by type and date, locating an appropriate folder location for software installation or enabling a specified hidden toolbar in a word processor
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 and interpret data reports from given electronic sources to answer specific, concrete questions. They assemble information in a simple linear and logical 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 • Identify the difference between paid and nonpaid search engine generated results when conducting research • Select clear, simple, relevant information from given information sources and include it in an information product • Make recommendations to improve the navigability of a website • Identify a potential problem with a website based on a web traffic report • Use graphics and text software editing features to manipulate aspects such as colour, image size and placement in simple information products • Apply software and file management functions using common conventions such as left aligning selected text, adding questions to an online survey, or creating and naming a new file on the desktop • Recognise the potential for ICT misuse, such as plagiarism, computer viruses, and deliberate identity concealment, and suggest measures to protect against them

Table A1: NAP – ICT Literacy 2017 proficiency level descriptors with examples (cont.)

Proficiency level	Proficiency level description	Examples of student responses
Level 2	Students working at Level 2 locate simple, explicit information from within a given electronic source. They add content to and make simple changes to existing information products when instructed. They edit information products to create products that show limited consistency of design and information management. They recognise and identify basic ICT electronic security and health and safety usage issues and practices	• Locate explicit relevant information or links to information from within a webpage • Use metadata, such as date, to help identify and select relevant files • 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 webpage to a list of favourites (bookmarks) in a web browser or opening an email attachment • Recognise common computer-use conventions and practices, such as the use of the 'edu' suffix in the URL of a school's website, the need to keep virus protection software up to date and the need to maintain good posture when using a computer • Explain the purpose of specific school ICT use and social media use policies
Level 1	Students working at Level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions	• Apply graphics editing software functions, such as adding and moving predefined shapes and adjusting property sliders to control the basic appearance of an 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' functions, clicking on a hyperlink to go to a webpage, or selecting all the text on a page • Recognise basic computer-use conventions, such as identifying the main parts of a computer and that the 'shut down' command is a safe way to turn off a computer