General Capabilities in the Australian Curriculum

January 2012

www.acara.edu.au
Information and communication technology (ICT) capability

Introduction

In the Australian Curriculum, students develop ICT capability as they learn to use ICT effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively in all learning areas at school, and in their lives beyond school. The capability involves students in learning to make the most of the digital technologies available to them, adapting to new ways of doing things as technologies evolve and limiting the risks to themselves and others in a digital environment.

The *Melbourne Declaration on the Educational Goals for Young Australians* (MCEETYA 2008) recognises that in a digital age, and with rapid and continuing changes in the ways that people share, use, develop and communicate with ICT, young people need to be highly skilled in its use. To participate in a knowledge-based economy and to be empowered within a technologically sophisticated society now and into the future, students need the knowledge, skills and confidence to make ICT work for them at school, at home, at work and in their communities.

Information and communication technologies are fast and automated, interactive and multimodal, and they support the rapid communication and representation of knowledge to many audiences and its adaptation in different contexts. They transform the ways that students think and learn and give them greater control over how, where and when they learn.

Scope of ICT capability

The nature and scope of ICT capability is not fixed, but is responsive to ongoing technological developments. This is evident in the emergence of advanced internet technology over the past few years and the resulting changes in the ways that students construct knowledge and interact with others.

Students develop capability in using ICT for tasks associated with information access and management, information creation and presentation, problem solving, decision making, communication, creative expression, and empirical reasoning. This includes conducting research, creating multimedia information products, analysing data, designing solutions to problems, controlling processes and devices, and supporting computation while working independently and in collaboration with others.

Students develop knowledge, skills and dispositions around ICT and its use, and the ability to transfer these across environments and applications. They learn to use ICT with confidence, care and consideration, understanding its possibilities, limitations and impact on individuals, groups and communities.

ICT capability across the curriculum

ICT capability supports and enhances student learning across all areas of the curriculum. Students develop and apply ICT knowledge, skills and appropriate social and ethical protocols and practices to investigate, create and communicate, as well as developing their ability to manage and operate ICT to meet their learning needs.
Learning areas provide the content and contexts within which students develop and apply the knowledge, skills, behaviours and dispositions that comprise ICT capability.

**ICT capability and the Technologies learning area**

Information and communication technology is represented in two ways in the Australian Curriculum: through the ICT capability that applies across all learning areas and within the Technologies curriculum through Digital technologies. The ICT capability will be reviewed (and revised if necessary) to ensure that there is consistency with the Technologies curriculum following its development.

The ICT capability is addressed through the learning areas and is identified wherever it is developed or applied in content descriptions. It is also identified where it offers opportunities to add depth and richness to student learning in content elaborations. An icon indicates where ICT capability has been identified in learning area content descriptions and elaborations. A filter function on the Australian Curriculum website assists users to identify F–10 curriculum content where ICT capability has been identified. Teachers may find further opportunities to incorporate explicit teaching of ICT capability depending on their choice of activities. Students can also be encouraged to develop capability through personally relevant initiatives of their own design.

- Information and communication technology in English
  (http://www.australiancurriculum.edu.au/English/General-capabilities)
- Information and communication technology in Mathematics
  (http://www.australiancurriculum.edu.au/Mathematics/General-capabilities)
- Information and communication technology in Science
  (http://www.australiancurriculum.edu.au/Science/General-capabilities)
- Information and communication technology in History
  (http://www.australiancurriculum.edu.au/History/General-capabilities)

**Background**

This background summarises the evidence base from which the ICT capability’s introduction, organising elements and learning continuum have been developed. It draws on recent international and national research, as well as initiatives and programs that focus on ICT across the curriculum.

ICT capability is based on sets of relevant knowledge, skills, behaviours and dispositions. Internationally, such capability is typically represented developmentally across interrelated domains or elements to show increasingly sophisticated experiences with the technology. For example, the ICT curriculum for England presents ‘lines of progression’ in strands and sub-strands. The National Education Technology Standards (NETS) for students provided by the International Society for Technology in Education (ISTE) represent capability with six sets of standards. In Australia, the *Statements of Learning for ICT* were presented as five broadly defined conceptual organisers, representing key aspects of ICT that apply across the curriculum. The Australian Council for Educational Research (ACER) has also identified a progression in research associated with the National Assessment Program – ICT Literacy.

Early researchers into ICT in education, such as Papert (1980) and Turkle (1984), considered that students constructed reality from experience and prior knowledge. The student interacts with the environment and, to cope with this environment, develops a conceptual framework to explain the interaction. More recent theorists, such as Dede (2009),
echo these earlier propositions even as technologies evolve, giving rise to the set of constructs upon which the ICT capability is based. In particular, the overarching element Applying social and ethical protocols and practices when using ICT addresses the personal, social and cultural contexts introduced by theorists such as Papert and Turkle.

ICT capability is based on the assumption that technologies are digital tools that enable the student to solve problems and carry out tasks. That is, the ICT system needs to suit the student and the task, while the student needs to develop an understanding of what the machine can do and an appreciation of the limitations under which it operates. In this way, students come to perceive ICT systems as useful tools rather than feeling that they themselves are the tools of the machine (Maas 1983). The latter often occurs when users have little information about how ICT systems operate and simply follow set, standard procedures, determined for them by the system.

Therefore, ICT capability needs to consider the types of tasks that provide authentic contexts for learning. The range of tasks is categorised into three sets: Investigating with ICT, Communicating with ICT and Creating with ICT. Students also need the knowledge and skills to use ICT based on an understanding of the ‘nature of the machine’. This is encompassed in the Managing and operating ICT element of the continuum.

References


**Organising elements**

The ICT capability learning continuum 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 diagram below sets out these elements.

![Organising elements for ICT capability](image)

**Applying social and ethical protocols and practices when using ICT**

Students develop ICT capability within a context of social and ethical protocols and practice. This element involves students in developing an understanding of:

- intellectual property pertaining to digital information
- digital information security, including the responsibility to:
  - protect the rights, identity, privacy and emotional safety of online audiences
  - avoid and prevent cyberbullying
  - ensure security of self and/or others
  - respect audiences, being aware of the portrayal of self and others
- the benefits and consequences of ICT for individuals, groups and communities in society, such as:
  - becoming drivers of ICT, seeing themselves as creators as well as consumers of ICT
  - recognising its capacity to enhance participation and inclusion
- analysing how changes in technology impact on and relate to changes in society.

**Investigating with ICT**

This element involves students in using ICT to access data and information from a range of primary and secondary sources when investigating questions, topics or problems. To do this effectively and efficiently, students use processes of defining, planning, locating, accessing, selecting, organising and evaluating information and data. Students use ICT to:

- define and plan information searches
- locate and access data and information through:
  - search engines, search functions, and general and specialised directories
  - navigation tools between and within documents
  - opening files of different formats
  - organising data and information using a range of ICT tools
- select and evaluate data and information by applying criteria to verify the integrity of data and information and their sources.

**Creating with ICT**

This element involves students in using ICT to generate ideas, plans, processes and solutions to challenges and tasks. These may relate to learning a concept, completing an activity or responding to a need, and may be self- or teacher-generated. Students use ICT to generate ideas, plans and processes to:

- clarify a task, or the steps and processes required to develop responses to questions or solutions to problems
- generate products or solutions for challenges and learning area tasks to:
  - develop, refine and present new understandings in a digital form
  - create a digital input or a process to support a digital output to transform digital data and information.

**Communicating with ICT**

This element involves students in using ICT to communicate ideas and information with others and collaboratively construct knowledge, in adherence with social protocols appropriate to the communicative context (purpose, audience and technology). Students use ICT to:

- share, exchange and collaborate to enhance learning by:
  - sharing information in digital forms
  - exchanging information through digital communication
  - collaborating and collectively contributing to a digital product
- understand and apply social protocols to receive, send and publish digital data and information, taking into account characteristics of users
• apply techniques or strategies to ensure security of digital information, to control access, protect files and report abuse.

**Managing and operating ICT**

This element involves students in using ICT to investigate, create and communicate. This involves applying technical knowledge and skills to work with information as required and use information classification and organisation schemes. Students:

• use digital technologies efficiently including:
  - troubleshooting
  - adjusting parameters
  - monitoring occupational health and safety issues

• select appropriate combinations of digital hardware and software to match the needs of the user and the task

• understand the transferability of knowledge and skills between digital systems and applications

• use software to manage and maintain information in digital files.
### ICT capability continuum across stages of schooling

#### Applying social and ethical protocols and practices

<table>
<thead>
<tr>
<th>By the end of Year 2 students:</th>
<th>By the end of Year 6 students:</th>
<th>By the end of Year 10 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intellectual property</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recognise that people create information resources and that the information they create or provide can be used or misused by others (for example understanding that you cannot copy someone else’s work)</td>
<td>apply practices that comply with legal obligations regarding the ownership and use of information resources (for example naming sources, avoiding plagiarism, knowing what may or may not be copied)</td>
<td>recognise ethical dilemmas and apply practices that protect intellectual property (for example understanding that pirating denies musicians payment for their work)</td>
</tr>
<tr>
<td><strong>Information security</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>follow class rules about using resources and apply basic guidelines to secure personal information (for example recognising that when logging onto the network, they are only able to access their own folders)</td>
<td>apply strategies for protecting the security of personal information (for example checking integrity of web links)</td>
<td>use a range of strategies for securing and protecting information and understand the need for codes and conduct (for example using filters to divert junk mail)</td>
</tr>
<tr>
<td><strong>Personal security</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recognise the need to take care in sharing personal information (for example messaging only to people you know)</td>
<td>recognise the rights, identity, privacy and emotional safety of themselves and others when using ICT (for example understanding the dangers of providing personal information, recognising ways of using ICT that can result in cyberbullying)</td>
<td>apply appropriate strategies to protect rights, identity, privacy and emotional safety of others when using ICT (for example identifying possible consequences of posting personal information on social networking sites, taking responsibility for the effect of their communications on other people)</td>
</tr>
<tr>
<td><strong>ICT and society</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify how ICT is used in their homes and at school (for example identifying examples in the community such as borrowing a library book, online lunch ordering)</td>
<td>explain the use of ICT at school and in the local community, and understand its impact on their lives (for example recognising the potential impact on health of prolonged electronic game playing)</td>
<td>assess the impact of ICT in the workplace and in society, and speculate on its role in the future and how they can influence its use (for example recognising the potential of enhanced inclusivity for people with disability through ICT)</td>
</tr>
</tbody>
</table>
## Investigating with ICT

<table>
<thead>
<tr>
<th>By the end of Year 2 students:</th>
<th>By the end of Year 6 students:</th>
<th>By the end of Year 10 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Defining and planning information searches</strong></td>
<td><strong>Locating and accessing data and information</strong></td>
<td><strong>Selecting and evaluating data and information</strong></td>
</tr>
<tr>
<td>use ICT to identify, record, group and classify textual and graphic information to show what is known and what needs to be investigated (for example using colour coding, drawing software to show steps in a sequence)</td>
<td>use appropriate ICT to identify and represent patterns in sets of information and to pose questions (for example using tables in word processing and charts in spreadsheets)</td>
<td>select and use appropriate ICT independently and collaboratively, analyse information to frame questions and plan search strategies (for example using wikis, searching databases)</td>
</tr>
<tr>
<td><strong>Locating and accessing data and information</strong></td>
<td><strong>Selecting and evaluating data and information</strong></td>
<td></td>
</tr>
<tr>
<td>locate and retrieve textual and graphic information from a range of digital sources (for example locating information following hyperlinks and typing in simple URL, printing pages, copying and pasting text and images)</td>
<td>plan, locate (using search engines and basic search functions), retrieve and organise information in meaningful ways (for example searching within document – find/search/buttons/tabs; locating files within school directory; searching across web or within site)</td>
<td>use advanced search tools and techniques to locate precise data and information that supports the development of new understandings (for example using logical statements such as true/false; searching within fields or for data type; using datalogger equipment, digital microscope)</td>
</tr>
<tr>
<td><strong>Selecting and evaluating data and information</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>explain the usefulness of located information (for example explaining how digital information answers a question)</td>
<td>assess the suitability of information using appropriate criteria (for example selecting the most useful/reliable/relevant digital resource from a set of three or four alternatives)</td>
<td>develop and use criteria systematically to evaluate the quality, suitability and credibility of located information and sources (for example comparing objective data from multiple digital sources to evaluate the likely credibility of the information provided)</td>
</tr>
</tbody>
</table>
## Creating with ICT

<table>
<thead>
<tr>
<th>By the end of Year 2 students:</th>
<th>By the end of Year 6 students:</th>
<th>By the end of Year 10 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generating ideas, plans and processes</strong></td>
<td><strong>Generating solutions to challenges and learning area tasks</strong></td>
<td><strong>Generating solutions to challenges and learning area tasks</strong></td>
</tr>
<tr>
<td>use ICT to prepare simple plans to find solutions or answers to questions (for example drawing simple mindmap using conceptual mapping software; drawing software to show steps in sequence)</td>
<td>use ICT effectively to record ideas, represent their thinking and plan solutions (for example using timeline software to plan processes; concept mapping and brainstorming software to generate key ideas)</td>
<td>select and use ICT to articulate ideas and concepts, and plan the development of complex solutions (for example using software to create hyperlinks, tables and charts)</td>
</tr>
<tr>
<td>experiment with ICT as a creative tool to generate simple solutions or modifications for particular audiences or purposes (for example using the basic functionality of limited software to manipulate text, images, audio and numbers)</td>
<td>create digital solutions, independently or collaboratively, for particular audiences and purposes (for example manipulating images, text, video and sound for presentations; creating podcasts)</td>
<td>design and modify creative digital solutions, for particular audiences and for a range of purposes (for example modelling solutions in spreadsheets, creating movies, animations, websites and music; programming games; using databases; creating web pages for visually impaired users)</td>
</tr>
</tbody>
</table>
## Communicating with ICT

<table>
<thead>
<tr>
<th>By the end of Year 2 students:</th>
<th>By the end of Year 6 students:</th>
<th>By the end of Year 10 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collaborating sharing and exchanging</strong></td>
<td><strong>Collaborating sharing and exchanging</strong></td>
<td><strong>Collaborating sharing and exchanging</strong></td>
</tr>
<tr>
<td>use identified ICT tools safely to share and exchange information with appropriate audiences (for example using email to read and post electronic messages)</td>
<td>select and use appropriate ICT tools safely to share and exchange information and to collaborate with others (for example contributing to the content of a wiki; blogging and posting to bulletin boards)</td>
<td>select and use a range of ICT tools efficiently and safely to share and exchange information and to construct knowledge collaboratively (for example using online applications and management tools for collaborative projects such as online portals, wikis)</td>
</tr>
<tr>
<td><strong>Understanding and applying social protocols</strong></td>
<td><strong>Understanding and applying social protocols</strong></td>
<td><strong>Understanding and applying social protocols</strong></td>
</tr>
<tr>
<td>apply basic social protocols when communicating with known audiences (for example addressing recipients appropriately in emails)</td>
<td>apply generally accepted social protocols when sharing information in online environments, taking into account different social and cultural contexts (for example not posting a photo without the owner's permission; not revealing details of identity)</td>
<td>discriminate between protocols suitable for different communication tools when collaborating with local and global communities (for example using appropriate salutations; adjusting length and formality of message to suit form of communication)</td>
</tr>
<tr>
<td><strong>Applying techniques or strategies to ensure security of information</strong></td>
<td><strong>Applying techniques or strategies to ensure security of information</strong></td>
<td><strong>Applying techniques or strategies to ensure security of information</strong></td>
</tr>
<tr>
<td>use limited techniques to ensure digital security (for example logging on to server and email)</td>
<td>independently establish secure accounts for approved online environments (for example using non-predictable user names and passwords)</td>
<td>assess the risks associated with online environments and establish appropriate security strategies as required (for example modifying default parameters at social networking site)</td>
</tr>
</tbody>
</table>
### Managing and operating ICT

<table>
<thead>
<tr>
<th>By the end of Year 2 students:</th>
<th>By the end of Year 6 students:</th>
<th>By the end of Year 10 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Using ICT efficiently and ergonomically</strong></td>
<td><strong>Selecting hardware and software</strong></td>
<td><strong>Understanding ICT systems</strong></td>
</tr>
<tr>
<td>safely use a limited range of devices, functions and commands when operating an ICT system (for example mouse, USB flash drive, printer, digital camera, robot)</td>
<td>use a range of devices ergonomically and with increasing efficiency, and use basic troubleshooting procedures to solve routine malfunctions (for example using printer queues, file servers, scanners, probes, digital cameras)</td>
<td>use and optimise a selected range of devices and software functions to meet particular tasks (for example altering toolbars, sorting and layout functions; using duplex printing; setting proxies)</td>
</tr>
<tr>
<td><strong>Selecting hardware and software</strong></td>
<td><strong>Managing digital data</strong></td>
<td></td>
</tr>
<tr>
<td>identify appropriate software for a task (for example using page layout software for posters)</td>
<td>manage and maintain digital files with guidance (for example saving and retrieving files; providing unique names for files; applying basic functions such as opening and dragging-and dropping files)</td>
<td>manage and maintain files securely in a variety of storage mediums and formats (for example designing and using logical and sustainable file/folder naming conventions; maintaining version control of documents; limiting access to files by location or password)</td>
</tr>
<tr>
<td>select from appropriate hardware and software to undertake specific tasks (for example selecting specific graphics software or graphic tools in word processors)</td>
<td>effectively manage and maintain files on different storage mediums – locally and on networks (for example saving/exporting data in files of different formats; routinely backing up and protecting data; moving a file from one location to another)</td>
<td></td>
</tr>
<tr>
<td>independently select and apply appropriate software and hardware to suit specific tasks, purposes and social contexts (for example selecting an appropriate option for creating a website such as an online tool or an HTML editor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the uses of basic ICT system components (for example input – keyboard; process – central processing unit; output – display to monitor; storage – USB, hard drive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>apply an understanding of ICT system components to make changes to functions, processes, procedures and devices to fit the purpose of the solutions (for example saving files in different formats so that they are compatible across different software platforms)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>