Years 9 and 10 standard elaborations — Australian Curriculum: Digital Technologies

Purpose   The standard elaborations (SEs) provide additional clarity when using the Australian Curriculum achievement standard to make judgments on a five-point scale. They can be used as a tool for:

- making consistent and comparable judgments about the evidence of learning in a folio of student work
- developing task-specific standards for individual assessment tasks.

Structure   The SEs are developed using the **Australian Curriculum achievement standard**. The Digital Technologies achievement standard describes the learning expected of students at each band. Teachers use the achievement standard during and at the end of a period of teaching to make on-balance judgments about the quality of learning students demonstrate.

In Queensland the achievement standard represents the **C standard** — a sound level of knowledge and understanding of the content, and application of skills. The SEs are presented in a **matrix**. The discernible differences or degrees of quality associated with the five-point scale are highlighted to identify the characteristics of student work on which teacher judgments are made. Terms are described in the Notes section following the matrix.

Years 9 and 10 Australian Curriculum: Digital Technologies achievement standard
By the end of Year 10, students explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users. They explain simple data compression, and why content data are separated from presentation.   Students plan and manage digital projects using an iterative approach. They define and decompose complex problems in terms of functional and non-functional requirements. Students design and evaluate user experiences and algorithms. They design and implement modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities. They take account of privacy and security requirements when selecting and validating data. Students test and predict results and implement digital solutions. They evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise. They share and collaborate online, establishing protocols for the use, transmission and maintenance of data and projects.

Years 9 and 10 Digital Technologies standard elaborations

		A	B	C	D	E
		The folio of a student's work has the following characteristics:				
Knowledge and understanding	**Digital systems**	comprehensive explanation of: • the control and management of networked digital systems • the security implications of the interaction between hardware, software and users	detailed explanation of: • the control and management of networked digital systems • the security implications of the interaction between hardware, software and users	explanation of: • the control and management of networked digital systems • the security implications of the interaction between hardware, software and users	description of: • the control and management of networked digital systems • the security implications of the interaction between hardware, software and users	statements about: • the control and management of networked digital systems • the security implications of the interaction between hardware, software and users
	Representation of data	comprehensive explanation of: • simple data compression • why content data are separated from presentation	detailed explanation of: • simple data compression • why content data are separated from presentation	explanation of: • simple data compression • why content data are separated from presentation	description of: • simple data compression • why content data are separated from presentation	statements about: • simple data compression • why content data are separated from presentation

		A	B	C	D	E
Processes and production skills	**Collecting, managing and analysing data**	<u>discerning</u> selection and validation of data, taking account of privacy and security requirements	<u>informed</u> selection and validation of data, taking account of privacy and security requirements	selection and validation of data, taking account of privacy and security requirements	<u>partial</u> selection and validation of data, taking account of <u>aspects of</u> privacy and security requirements	<u>fragmented</u> selection and validation of data, taking account of <u>aspects of</u> privacy and security requirements
	Investigating and defining	<u>purposeful</u> definition and decomposition of complex problems in terms of functional and non-functional requirements	<u>effective</u> definition and decomposition of complex problems in terms of functional and non-functional requirements	definition and decomposition of complex problems in terms of functional and non-functional requirements	<u>partial</u> definition and decomposition of complex problems in terms of functional and non-functional requirements	<u>fragmented</u> definition and decomposition of problems
	Generating and designing; producing and implementing	<u>purposeful</u> design and evaluation of user experiences and algorithms	<u>effective</u> design and evaluation of user experiences and algorithms	design and evaluation of user experiences and algorithms	<u>partial</u> design and <u>explanation</u> of user experiences and algorithms	<u>fragmented</u> design and <u>statements about</u> user experiences and algorithms
		<u>purposeful</u> design and <u>proficient</u> implementation of modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities	<u>effective</u> design and <u>effective</u> implementation of modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities	design and implementation of modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities	<u>partial</u> design and implementation of modular programs using algorithms and data structures	<u>fragmented</u> design and implementation of modular programs
		<u>systematic</u> testing and prediction of results and <u>proficient</u> implementation of digital solutions	<u>reliable</u> testing and prediction of results and <u>effective</u> implementation of digital solutions	testing and prediction of results and implementation of digital solutions	<u>partial</u> testing and prediction of results and <u>partial</u> implementation of digital solutions	<u>fragmented</u> testing and prediction of results <u>or</u> <u>fragmented</u> implementation of digital solutions

		A	B	C	D	E
Processes and production skills	**Evaluating**	**discerning** evaluation of information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise	**informed** evaluation of information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise	evaluation of information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise	**explanation** of information systems and their solutions	**description** of information systems and their solutions
	Collaborating and managing	**comprehensive** planning and management of digital projects using an iterative approach	**informed** planning and management of digital projects using an iterative approach	planning and management of digital projects using an iterative approach	**partial** planning and management of digital projects using an iterative approach	**fragmented** planning and management of digital projects
		proficient sharing and collaboration online, with establishment of **comprehensive and effective** protocols for the use, transmission and maintenance of data and projects	**effective** sharing and collaboration online, with establishment of **effective** protocols for the use, transmission and maintenance of data and projects	sharing and collaboration online, with establishment of protocols for the use, transmission and maintenance of data and projects	**partial** sharing and collaboration online **using** protocols for the use, transmission and maintenance of data and projects	**fragmented** sharing and collaboration online **using** protocols

Key	shading emphasises the qualities that discriminate between the A–E descriptors

Notes

Australian Curriculum common dimensions

The SEs describe the qualities of achievement in the two dimensions common to all Australian Curriculum learning area achievement standards — understanding and skills.

Dimension	Description
understanding	the concepts underpinning and connecting knowledge in a learning area, related to a student's ability to appropriately select and apply knowledge to solve problems in that learning area
skills	the specific techniques, strategies and processes in a learning area

Terms used in Years 9 and 10 Digital Technologies SEs

These terms clarify the descriptors in the Years 9 and 10 Digital Technologies SEs. Definitions are drawn from the ACARA Australian Curriculum Technologies glossary (www.australiancurriculum.edu.au/f-10-curriculum/technologies/glossary) and from other sources to ensure consistent understanding.

Term	Description
analyse	consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences
algorithm	the step-by-step procedures required to solve a problem; see also computational thinking
apply; application	use, utilise or employ in a particular situation
aspects	particular parts or features
binary	the use of two states or permissible values to represent data, such as the on and off position of a light switch or the transistors in a computer silicon chip that can be in either the electrical state of ON or OFF; typically represented as a series of single digits referred to as binary digits (or bits) due to each taking on the value of either 0 or 1; the image below shows how a dashed line might be represented in binary ON and OFF states for binary code 1 1 0 1 0 1 1 0 1 0 1 1 0 1 0 1 1
collaborating and managing (technologies process)	creating and communicating information, especially online, by creating websites, and interacting safely using appropriate technical and social protocols; in Years 9 and 10, students: • create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities; and • plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability

Term	Description
collecting, managing and analysing data (processes and production skills strand)	involves the nature and properties of data, how they are collected and interpreted using a range of digital systems and peripheral devices and interpreting data when creating information; in Years 9 and 10, students: • develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements; and • analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data
comprehensive	detailed and thorough, including all that is relevant
computational thinking	a problem-solving method that involves various techniques and strategies that can be implemented by digital systems; techniques and strategies include organising data logically, breaking down problems into parts (decomposing), defining abstract concepts, and designing and using algorithms, patterns and models
creation; create; creating	putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through designing, planning, or implementing; *creating* requires users to put parts together in a new way or synthesise parts into a new or different form or product; in Technologies, it involves bringing a solution into existence through the process of investigating and defining, generating and designing, producing and implementing, evaluating, and collaborating and managing
criteria for success	a descriptive list of essential features against which success can be measured; may be predetermined, negotiated with the class or developed by students; compilation of *criteria for success* involves: • literacy skills to select and use appropriate terminology • clarifying the project task and defining the need or opportunity to be resolved
critical	analysis or evaluation of an issue or information in order to form a critical judgment, especially in a detailed way, and involving skilful judgment as to truth or merit and is informed by evidence
critique; critiquing	a careful judgement in which opinions are given about the positive and negative aspects of something; considers good as well as bad performances, the individual parts, relationships of the individual parts and the overall performance; see also evaluating
data	in Digital Technologies, *data* refers to the discrete representation of information using number codes; may include characters (alphabetic, numbers, symbols), images (still and moving), sounds and instructions that can be manipulated, stored and communicated by digital systems; in Digital Technologies Years 9 and 10, *data* is categorical and relational
decompose; decomposing	to separate a complex problem into parts to allow it to be more easily understood; see also computational thinking
description; describe	give an account of characteristics or features
detailed	meticulous; including many of the parts

Term	Description
digital solution; digital solutions	the result (or output) of transforming data into information or action using digital systems, skills, techniques and processes to meet a need or opportunity; in Digital Technologies: • students create solutions that will use data, require interactions with users and within systems, and will have impacts on people, the economy and environments • solutions may be developed using combinations of readily available hardware and software applications, and/or specific instructions provided through programming (e.g. instructions for a robot, an adventure game, products featuring interactive multimedia including digital stories, animations and websites) in Years 9 and 10, students analyse problems and design, implement and evaluate a range of digital solutions (e.g. database-driven websites, artificial intelligence engines, simulations)
digital systems (knowledge and understanding strand)	digital hardware and software components (internal and external) used to transform data into digital solutions; when digital systems are connected they form a network; for example: • a smartphone is a digital system that has software (apps, an operating system), input components (e.g. touch screen, keyboard, camera and microphone), output components (e.g. screen and speakers), memory components (e.g. silicon chips, solid state drives), communication components (e.g. SIM card, wi-fi, bluetooth or mobile network antennas), and a processor made up of one or more silicon chips • a desktop computer with specific software and hardware components for dairy farming; the computer is connected via cables to milking equipment and via wi-fi to sensors that read tags on the cows; through these hardware components the software records how much milk each cow provides; such systems can also algorithmically control attaching milking equipment to each cow, providing feed and opening gates
digital technologies	any technologies controlled using digital instructions, including computer hardware and software, digital media and media devices, digital toys and accessories, and contemporary and emerging communication technologies; these technologies are based on instructions given using *binary* (0 or 1) code that invariably mean one or more processors are present to respond to these instructions; computers, smartphones, digital cameras, printers and robots are all examples of digital technologies
discerning	showing good judgment to make thoughtful choices; in Technologies, *discerning* includes informed
effective	meeting the assigned purpose in a considered and/or efficient manner to produce a desired or intended result
enterprise	a project or activity that may be challenging, requires effort and initiative and may have risks

Term	Description
evaluate; evaluation; evaluating (technologies process)	examine and judge the merit or significance of something; in Technologies, *evaluate* means measures performance against established criteria; estimates the nature, quality, ability, extent or significance to make a judgment determining the value; see also critiquing; in Digital Technologies, *evaluating* includes: • solutions that have been developed by students • examining how well existing information systems meet different needs in Years 9 and 10, students: • evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability: and • provide opportunities for innovation and enterprise
explanation; explain	provide additional information that demonstrates understanding of reasoning and/or application
file transfer protocol (FTP)	a set of rules or standards for transmitting files between digital systems on the internet; see protocols
fragmented	disjointed, incomplete or isolated
functional	design of products, services or environments to ensure they are fit for purpose and meet the intended need or market opportunity and identified criteria for success
generating and designing (technologies process)	states what is required of the solution; in Years 9 and 10, students: • design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics; • design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and text cases
hypertext transfer protocol (HTTP)	a set of rules or standards for transferring files and messages on the world wide web, specifically to allow linking of files and text; provides a standard for web browsers to render pages (i.e. present them in an intended form) and servers to communicate; see protocols
identification; identify	to establish or indicate who or what someone or something is
implement; implementing; implementation	to put into effect by means of a plan or procedure; in Technologies, *implementing* a solution involves using specific software functions and items of hardware
information systems	the combination of digital hardware and software components (digital systems), data, processes and people that interact to create, control and communicate information
informed	having relevant knowledge; being conversant with the topic; in Technologies, *informed* refers to the underpinning knowledge, understanding and skills of processes and production skills when solving problems and creating solutions
innovation	something new or different introduced; a creation (a new device or process) resulting from study and experimentation

Term	Description
interactive; interaction	the back-and-forth dialog between the user and the computer; computer games are always interactive, and most computer applications are interactive (i.e. the user selects a task and the computer carries it out; then the user selects another); many web pages are interactive and increasingly function like locally installed applications
investigating and defining (technologies process)	describes the problem and/or opportunity and states what is required of the solution; in Years 9 and 10, students define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs
iteration; iterative	repetition of a process or set of instructions in computer programming, where each repeated cycle builds on the previous; typically this uses a FOR loop command with a counter , e.g. for number = 1 to 9 sum = sum + number
object-oriented programming language (OOP)	a programming language that supports the *object-oriented programming* paradigm (e.g. C++, Eiffel, Java, Python and Scala); *objects* represent a combination of data (the attributes of an object) and the actions that can be performed on or with that data (the methods of the object); the valid attributes and methods of an object are defined by its class, and these attributes and methods can be inherited from the definition of another class
partial	attempted; incomplete evidence provided
plan; planning	a scheme of action or procedure; a detailed proposal for doing something
processes and production skills	the skills needed to create digital solutions; see technologies processes
producing and implementing (technologies process)	actively realising (making) digital solutions using appropriate resources and means of production; in Years 9 and 10, students implement modular programs, applying selected algorithms and data structures including using an object-oriented programming language
product; products	one of the outputs of technologies processes, the end result of processes and production; *products* are the tangible end results of natural, human, mechanical, manufacturing, electronic or digital processes to meet a need or want
proficient	competent or skilled in doing or using something; in Digital Technologies, *proficient* means consistently in all digital solutions
project	the set of activities undertaken by students to address specified content, involving: • understanding the nature of a problem, situation or need • creating, designing and producing a solution to the project task • documenting the process; a project has: • a benefit, purpose and use • a user or audience who can provide feedback on the success of the solution • limitations to work within • a real-world technologies context influenced by social, ethical and environmental issues • criteria for success to judge its success

Term	Description
protocols	generally accepted standards or rules that govern relationships and interactions between and within information systems; useful protocols include: • file transfer protocol (FTP) • hypertext transfer protocol (HTTP) • social protocols
purposeful	intentional; done by design; focused and clearly linked to the goals of the task
reliable	constant and dependable or consistent and repeatable
representation of data (knowledge and understanding strand)	how data are represented and structured symbolically for use by digital systems; in Years 9 and 10, students analyse simple compression of data and how content data are separated from presentation
risk management practices	the practice of identifying potential risks in advance, analysing them and taking precautionary steps to reduce/curb the risk; involves risk identification, analysis, response planning, monitoring, controlling and reporting
social protocols	generally accepted rules or behaviours for when people interact in online environments (e.g. using language that is not rude or offensive to particular cultures, not divulging personal details about people without their permission); see protocols
statement	a sentence or assertion
sustainability	supports the needs of the present without compromising the ability of future generations to support their needs
systematic	methodical, organised and logical
technologies	the materials, data, systems, components, tools and equipment used to create solutions for identified needs and opportunities, and the knowledge, understanding and skills used by people involved in the selection and use of these
technologies processes (processes and production skills strand)	the processes that allow the creation of a solution for an audience (end user, client or consumer) and involve the purposeful use of technologies and other resources and appropriate consideration of impact when creating and using solutions; typically require critical and creative thinking, such as computational, design or systems thinking; in Technologies, the *technologies processes* involve: • investigating and defining • generating and designing • producing and implementing • evaluating • collaborating and managing
user	one who uses a computer, computer program, or online service