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

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| 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. |
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| 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. | |
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| **Source** | Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum Version 8 Digital Technologies for Foundation–10*, [www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies](https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies) |

## Years 9 and 10 Digital Technologies standard elaborations

|  | | A | B | C | D | E |
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|  | | 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 |
| Processes and production skills | Collecting, managing and analysing data | discerning selection and validation of data, taking account of privacy and security requirements | informed selection and validation of data, taking account of privacy and security requirements | selection and validation of data, taking account of privacy and security requirements | partial selection and validation of data, taking account of aspects of privacy and security requirements | fragmented selection and validation of data, taking account of aspects of privacy and security requirements |
| Investigating and defining | purposeful definition and decomposition of complex problems in terms of functional and non‑functional requirements | effective 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 | partial definition and decomposition of complex problems in terms of functional and non‑functional requirements | fragmented definition and decomposition of problems |
| Generating and designing;  producing and implementing | purposeful design and evaluation of user experiences and algorithms | effective design and evaluation of user experiences and algorithms | design and evaluation of user experiences and algorithms | partial design and explanation of user experiences and algorithms | fragmented design and statements about user experiences and algorithms |
| purposeful design and proficient 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 | effective design and effective 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 | partial design and implementation of modular programs using algorithms and data structures | fragmented design and implementation of modular programs |
| systematic testing and prediction of results and proficient implementation of digital solutions | reliable testing and prediction of results and effective implementation of digital solutions | testing and prediction of results and implementation of digital solutions | partial testing and prediction of results and partial implementation of digital solutions | fragmented testing and prediction of results or fragmented implementation of digital solutions |
| 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 |

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| 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.

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| 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](https://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](#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](#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  image2 |
| collaborating and managing ([technologies process](#technologies_processes)) | 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 |
| collecting, managing and analysing data  ([processes and production skills strand](#process_and_production_skills)) | 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](#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](#digital_systems); techniques and strategies include organising data logically, breaking down problems into parts ([decomposing](#decompose)), defining abstract concepts, and designing and using [algorithms](#algorithm), 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](#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](#computational_thinking) |
| description; describe | give an account of characteristics or features |
| detailed | meticulous; including many of the parts |
| digital solution; digital solutions | the result (or output) of transforming data into information or action using [digital systems](#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](#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](#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](#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 |
| evaluate; evaluation; evaluating ([technologies process](#technologies_processes)) | 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](#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](#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](#technologies_processes)) | 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](#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](#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](#process_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 |
| 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](#technologies_processes)) | 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](#digital_solutions);  see [technologies processes](#technologies_processes) |
| producing and implementing ([technologies process](#technologies_processes)) | 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](#object_oriented_programming_language) |
| product; products | one of the outputs of [technologies processes](#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](#criteria_for_success) to judge its success |
| protocols | generally accepted standards or rules that govern relationships and interactions between and within [information systems](#information_systems); useful protocols include:   * [file transfer protocol (FTP)](#file_transfer_protocol) * [hypertext transfer protocol (HTTP)](#hypertext_transfer_protocol) * [social protocols](#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](#data) are represented and structured symbolically for use by digital systems;  in Years 9 and 10, students [analyse](#analyse) simple compression of [data](#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](#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](#process_and_production_skills)) | the processes that allow the creation of a solution for an audience (end user, client or consumer) and involve the purposeful use of [technologies](#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](#investigating_and_defining) * [generating and designing](#generating_and_designing) * [producing and implementing](#producing_and_implementing) * [evaluating](#evaluating) * [collaborating and managing](#collaborating_and_managing) |
| user | one who uses a computer, computer program, or online service |