# Computing Technology Stage 5 (Year 9) – sample program of learning

**Enterprise systems – analysing data**



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## Rationale

The NSW Department of Education publishes a range of curriculum support materials, including samples of lesson sequences, scope and sequences, assessment tasks, examinations, student and teacher resource booklets, and curriculum planning and curriculum evaluation templates. The samples are not exhaustive and do not represent the only way to complete or engage in each of these processes. Curriculum design and implementation is a dynamic and contextually-specific process. While the mandatory components of syllabus implementation must be met by all schools, it is important that the approach taken by teachers is reflective of their needs and faculty or school processes.

NESA defines [programming](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming) as the process of ‘selecting and sequencing learning experiences which enable students to engage with syllabus outcomes and develop subject specific skills and knowledge’ (NESA 2022). A program is developed collaboratively within a faculty. It differs from a unit in important ways, as outlined by NESA on their [advice on units](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming/advice-on-units) page. A unit is a contextually-specific plan for the intended teaching and learning for a particular class for a particular period. The organisation of the content in a unit is flexible and it may vary according to the school, the teacher, the class, and the learning space. They should be working documents that reflect the thoughtful planning and reflection that takes place during the teaching and learning cycle. There are mandatory components of programming and unit development, and this template provides one option for the delivery of these requirements. The NESA and department guidelines that have influenced this template are elaborated upon at the end of the document.

This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource has suggested timeframes that may need to be adjusted by the teacher to meet the needs of their students.

## Overview

**Description**: this program of learning addresses and introduces **the focus area of ‘Analysing data’.** The lessons and sequences in this program of learning are designed to allow students to develop the knowledge and skills to **analyse and visualise data to create a digital solution to address a user’s requirements.**

During weeks 1 to 14 of the learning sequence, students will gain an understanding of the computational, design and systems thinking used in **data analysis. This includes the questions, concepts and tools required to inform decisions and solve problems.**

**A range of scenarios and case studies will be investigated that allow students to** understand how data analysis is now an essential feature of all human enterprise.

During weeks 15 to 18 of the learning sequence, students work individually to analyse and visualise datasets to design, construct and test a digital solution to a real-world problem or opportunity. Students manage, document and explain individual work practices.

During weeks 19 to 20 of the learning sequence, students showcase their project to the class and seek self and peer review.

**Duration**: this program of learning is designed to be completed over a period of approximately 20 weeks in 60-minute lesson sequences but can be adapted to suit the school context.

**Explicit teaching**: suggested learning intentions and success criteria are available for some lessons provided. Learning intentions and success criteria are most effective when they are contextualised to meet the needs of students in the class. The examples provided in this document are generalised to demonstrate how learning intentions and success criteria could be created.

## Outcomes

A student:

* applies iterative processes to define problems and plan, design, develop and evaluate computing solutions **CT5-DPM-01**
* understands how innovation, enterprise and automation have inspired the evolution of computing technology **CT5-EVL-01**
* explains how data is stored, transmitted and secured in digital systems and how information is communicated in a range of contexts **CT5-DAT-01**
* communicates ideas, processes and solutions using appropriate media **CT5-COM-01**
* applies computational, design and systems thinking to the development of computing solutions **CT5-THI-01**
* acquires, represents, analyses and visualises simple and structured data **CT5-DAT-02**

[Computing Technology 7–10 Syllabus](https://curriculum.nsw.edu.au/syllabuses/computing-technology-7-10-2022) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2022.

**Prior to planning for teaching and learning, please consider the following:**

**Engagement**

How will I provide authentic, relevant learning opportunities for students to personally connect with lesson content?

How will I support every student to grow in independence, confidence and self-regulation?

How will I facilitate every student to have high expectations for themselves?

How will I identify and provide the support each student needs to sustain their learning efforts?

**Representation**

What are some different ways I can present content to enable every student to access and understand it?

How will I identify and address language and/or cultural considerations that may limit access to content for students?

How will I make lesson content and learning materials more accessible?

How will I plan learning experiences that are relevant and challenging for the full range of students in the classroom?

**Expression**

How will I provide multiple ways for students to respond and express what they know?

What tools and resources can students use to demonstrate their understanding?

How will I know if every student has understood the concepts and language presented in each lesson?

How will I monitor if every student has achieved the learning outcomes and learning growth?

## Lesson sequence and details

### Week 1

Table – week 1 – introduction lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01Content:Students:* differentiate between data and information
* describe the purpose of analysing data.
 | **Learning intention**Understand the course structure, expectations and the assessment for the analysing data focus area.**Success criteria*** I can describe and explain an overview of the focus area.
* I can use specialist terminology.

**Teaching and learning activity**Teacher introduces the learning sequence and gives an overview of the semester, outlining the sequence of activities and assessments.Students are introduced to the design production structure.Teacher describes the log in, file storage, access protocols and expectations for the class work and assessments.Students fill in a glossary as required or complete the glossary to ensure they are pre-taught vocabulary and can select and use specialist terminology in context.Students define data, data analysis and information after class discussion. | Students are pre-tested verbally on their understanding of data, data analysis and information.Students investigate the workbook and the glossary of key terms.Students commence a glossary of key terms and begin with defining data, data analysis and information. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Pre-teach key vocabulary and concepts prior to viewing videos, provide a transcript and use closed captions when viewing.Provide a glossary and allow the use of bilingual dictionaries for uncommon terms and use visuals where appropriate.This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |
| CT5-DAT-01CT5-THI-01Students:* differentiate between data and information
* represent and store data to facilitate computation, including selecting appropriate data types, understanding data type limitations and structuring data systematically
* summarise data using formulas, functions and features of a spreadsheet, including complex formulas, aggregate functions and lookup functions
* filter, group and sort data using a spreadsheet, including using filters and sorting, using conditional formatting and grouping and aggregating data
* present data and make predictions and decisions using a spreadsheet, including creating a data dashboard or report in a spreadsheet, decision formulas and optimisation.
 | **Learning intention**Investigate the difference between data and information.**Success criteria*** I can enter data into a spreadsheet.
* I can recognise how to make data into information.
* I can correctly categorise data and information.
* I can organise and describe data.

**Teaching and learning activity**Teacher-led discussion on the difference between data and information.Students complete a variety of activities that use spreadsheets to analyse data:* Activity 1: M&M data collection and introduction to spreadsheets
* Activity 2: random number exercise
* Activity 3: data into information table
* Activity 4: definitions table comparison
* Activity 5: computational thinking skills.

The M&M data collection activity introduces spreadsheets. Students complete a [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645) **activity and engage in a teacher-led discussion.**Activities are completed individually by students and unpacked through class discussion. | Students demonstrate a [basic use of spreadsheets (15:53)](https://www.youtube.com/watch?app=desktop&v=0tdlR1rBwkM) by:* opening the application
* entering data
* saving their work
* using the language of cells, values and worksheets
* practising using shortcut keys.

**Students contribute representations to class brainstorm and** [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645)**.**Students complete data into information table.Students distinguish between data and information by demonstrating the **appropriate use in a sentence.****Pre-test using** [Bebras resources](https://digitalcareers.csiro.au/en/Resources/Bebras-Unplugged).Students complete spreadsheet activities that demonstrate understanding of data types.Students demonstrate understanding by contributing to discussion. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Computational thinking skills pre-**test using** [Bebras resources](https://digitalcareers.csiro.au/en/Resources/Bebras-Unplugged) **will assist to identify differences in ability and understanding.**Extension: a lolly snake data analysis used by the engineering class to determine modulus of elasticity.Extension: student teams explore all the functions available and choose 3 to share with the class.Teacher may allocate a category for each team.Demonstrate the 1984 literary example from page 8 in What do the data really reveal? in the [digital technologies hub [DOC 1.71KB]](https://www.digitaltechnologieshub.edu.au/media/tselhjgn/9-10-assessment_task-what-does-the-data-tell.docx).**Students complete** [beginner cards](https://digitalcareers.csiro.au/en/Resources/Bebras-Unplugged) **to determine level of ability.**An example could include the use of closed captions when presenting videos to support the learning and accessibility needs of all students. |  |

### Week 2

Table – week 2 – data types lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-DAT-01Content:Students:* collect and interpret data, adhering to privacy and cybersecurity principles
* represent and store data to facilitate computation, including selecting appropriate data types, understanding data type limitations and structuring data systematically.
 | **Learning intention**Explore and revise how data is represented in digital systems.**Success criteria*** I can explain the limitations of data types.
* I can calculate age in hours using a spreadsheet.
* I can describe basic data types used in a programming language.

**Teaching and learning activity**Teacher-led discussion on data types.Students complete a variety of activities that focus on data types in the workbook:* Activity 6: introduction to data types.

The activity starts from a teacher-led example before students attempt the activity on their own. After the activity is completed individually by students, the activities are unpacked through class discussion led by teacher. | Students demonstrate the use of formulas within the spreadsheet to calculate how many hours and/or minutes they are old.Students explain verbally how they achieved this.Students correctly identify and categorise the data types used in programming languages. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Activity 6 can be extended to require students to calculate how many hours they have been at school.The average hours old of all students could be found and graphed.Students may benefit from a [refresher on binary data (6:34)](https://www.youtube.com/watch?v=b82kHMdEM4g) and the number of values a byte can contain (256, including zero).Teachers could draw up 4 bytes \*(32 bits) on the board and ask students to calculate the number of possible values. For further [detail on binary (10:45)](https://youtu.be/1GSjbWt0c9M). |  |

### Week 3

Table – week 3 – compression lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01Content:Students:* explain simple compression of data and types of compression.
 | **Learning intention**Understand the need for data compression.**Success criteria*** I can select appropriate data types.
* I can explain how compression works.

**Teaching and learning activity**Teacher-led discussion on simple compression of data commonly used and types of compression.Teacher-led discussion on the difference between finite and infinite.Discuss and investigate abbreviations in messaging and image compression.Students examine and complete activities from the workbook:* Activity 7: why compression?
* Activity 8: data compression
* Activity 9: image compression
* Activity 10: lossy and lossless compression.

Activities are completed individually by students and unpacked through class discussion.Students contribute to the construction of a [cline](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/566).[Clines](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/566) are sequences of words that go from one extreme to another (in this case lossy to lossless). | Students complete Activities 8 to 11 from the workbook including:* abbreviations in messaging (for example, BRB or ATM)
* image compression.

Students contribute to the construction of a [cline](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/566) on compression. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Using unplugged activities on [text compression](https://classic.csunplugged.org/activities/text-compression/) can form part of a literacy strategy. |  |

### Week 4

Table – week 4 – the purpose of analysing data lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01CT5-COM-01CT5-THI-01Content:Students:* consider the social impacts and ethical and legal responsibilities in analysing data
* explore data analysis considering the perspectives of diverse groups, including Aboriginal and Torres Strait Islander Peoples, culturally and linguistically diverse people, people of different ages and gender and people with disability.
 | **Learning intention**Understand how to collect and structure data to make information and describe the purpose of analysing data.**Success criteria*** I can explain the importance of organising data for meaning.
* I can describe the purpose of analysing data.

**Teaching and learning activity**Teacher discussesand explains data, information and the purpose of analysing data.Students complete a variety of activities that focus on data in the workbook:* Activity 11: data tables
* Activity 12: data headings
* Activity 13: collecting data
* Activity 14: data structures.

Activities are completed individually by students and unpacked through class discussion. | Students contribute to and complete Activities 12 to 15.Students respond to a class discussion and quiz on the importance of thinking carefully about the questions they want answered from the data and how they should structure the data. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Strategies and scenarios for Activities 12 to 15 should be based on student interest.The class handball tournament is an engaging introduction to data analysis or students could examine [sports data [DOC 504 KB]](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/elective-courses/media/documents/Critical-thinking-option-4-strategies-and-innovations-in-sports-the-path-to-victory.docx).The census data scenario should include reference to the fact that [Aboriginal and Torres Strait Islander peoples were counted in a census for the first time in 1971](https://www.nma.gov.au/defining-moments/resources/first-nations-peoples-census#:~:text=The%201971%20Census%20of%20Population,First%20Nations%20recognition%20and%20rights.).The [National Museum’s Defining Moments Digital classroom](https://digital-classroom.nma.gov.au/defining-moments/first-nations-peoples-counted-census) investigates the history of First Nations peoples and the census.[Students could be introduced to the 3Vs of big data](#The3Vs). |  |
| CT5-EVL-01Students:* explore the applications of small and big datasets.
 | **Learning intention**Understand the difference between small and big datasets and the purpose of analysing big datasets.**Success criteria*** I can explain what the ’right amount of data‘ is.
* I can explain the importance of census data.

**Teaching and learning activity**Teacher-led discussion on the what the ‘right amount of data’ is.Teacher-led discussion on the importance and impact of census data.Students complete a variety of activities that focus on data in the workbook:* Activity 15: case study
* Activity 16: What other data is collected over different time periods?
* Activity 17: answering questions
* Activity 18: the right amount of data
* Activity 19: summary describing the purpose of analysing data
* Activity 20: trends.

Activities are completed individually by students and unpacked through class discussion. | Students demonstrate understanding of small and big datasets.As part of summative assessment in Assessment task 1, students interview people about how they use data in their careers. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Provide visual and/or multimedia examples and check understanding of concepts.Ensure all students understand both technical and culturally based terms.Message abundancy may be useful when introducing new terminology. The word is spoken, written on the board, represented by visuals. |  |

### Week 5

Table – week 5 – the data lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01, CT5-DAT-01, CT5-COM-01Content:Students:* describe inputs, storage, transmission, processes and outputs in data analysis
* specify the functional requirements of a data analysis, including stating the purpose of a solution, describing use cases and developing test cases of inputs and expected outputs
* specify the non-functional requirements of a data analysis
* cost of access to data
* social benefit or fraud prevention
* scaling efficiently to large datasets.
 | **Learning intention**Identify components of a data analysis system and model the system, including describing use cases and developing test cases of inputs and expected outputs.**Success criteria*** I can identify and describe components of a scenario based on data analysis.
* I can understand the importance of testing a digital solution.
* I can explain the importance of testing and apply this knowledge to other scenarios.

**Teaching and learning activity**Teacher-led discussion on describing inputs, storage, transmission, processes and outputs in data analysis using various scenarios.Students identify and justify the use of inputs, storage, transmission, processes and outputs in a data analysis system.Teacher-led discussion on user cases and the importance of developing test cases.Students complete a variety of activities that focus on scenarios in the workbook:* Activity 21: jigsaw scenario IPO
* Activity 22: [how fitness trackers work](https://www.wareable.com/fitness-trackers/how-your-fitness-tracker-works-1449)
* Activity 23: modelling systems.

Activity 21 sees students contribute to a [jigsaw activity](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/546) to identify, describe and share their findings about their data analysis scenario.Activities 22 and 23 are completed individually by students and unpacked through team or class discussion. | Students contribute to the jigsaw activity to identify, describe and share their findings about their data analysis scenario.Students model the system using [Lucidchart (3:34)](https://www.youtube.com/watch?v=uWwoZ67vD_I)Functional versus non-functional requirements are a feature of each focus area in this syllabus and can be applied to any designed system or digital solution,Students identify the functional and non-functional requirements, inputs and outputs of any of the data analysis scenarios and focus on step counters to design experiments to test the Fitbit. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Definitions of non-functional issues may require word webs or [Frayer diagrams](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/553) to build vocabulary.Functional and non- functional requirements could be discussed via the use of [Clines](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/566).Students may be introduced to the concept of black box versus white box testing. |  |

### Week 6

Table – week 6 – big data case study lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* describe inputs, storage, transmission, processes and outputs in data analysis
* specify the functional requirements of a data analysis, including stating the purpose of a solution, describing use cases and developing test cases of inputs and expected outputs
* collect and interpret data adhering to privacy and cybersecurity principles.
 | **Learning intention**Investigate a case study to explore the purpose of data analysis and conduct an experiment to test inputs and expected outputs.**Success criteria*** I can navigate websites, extract information and identify the inputs to the system.
* I can describe use cases and develop test cases of inputs and expected outputs.

**Teaching and learning activity**Teacher-led discussion on specifying the functional requirements of a data analysis, including stating the purpose of a solution, describing use cases and developing test cases of inputs and expected outputs.* Activity 24: specify the functional and non-functional aspects of the fitness tracker data analysis example.
* Activity 25: data accuracy and validity of fitness trackers.

Students design and conduct experiments to determine the data accuracy and validity of [fitness trackers](https://microbit.thinkific.com/courses/controlling-physical-systems-with-sensors) or smart watches and apps.Teacher-led class discussion on how weather forecasts aren’t always right.Students complete a variety of activities that focus on the [Bureau of Meteorology](http://www.bom.gov.au/) in the workbook:* Activities 26–31: weather prediction.

Activities are completed individually by students and unpacked through class discussion.Students can connect that predictions and modelling data for weather use a variety of inputs and modelling. | Students explore the [Bureau of Meteorology](http://www.bom.gov.au/) as a case study for data analysis, functional requirements and use cases.Students determine the inputs of data that forms the output of this site.Students paraphrase an answer to [How come weather forecasts aren't always right?](https://www.abc.net.au/everyday/why-are-weather-forecasts-not-always-right/100579264)Students complete workbook activities. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Extension: students could be asked to consider the difference between the microchip hypothetical and the use of facial recognition software. |  |

### Week 7

Table – week 7 – social impacts lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01CT5-THI-01Content:Students:* consider the social impacts and ethical and legal responsibilities in analysing data
* describe how data analysis has evolved in response to people's needs and opportunities.
 | **Learning intention**Develop my understanding of social, ethical and legal responsibilities when analysing data.**Success criteria*** I can identify and evaluate social, ethical and legal responsibilities when analysing data.

**Teaching and learning activity**Teacher-led discussion on considering the social impacts and ethical and legal responsibilities in analysing data.Students complete activities to investigate various social, ethical and legal responsibilities:* Activity 32: hypothetical scenario
* Activity 33: [research facial recognition](https://ia.acs.org.au/article/2022/government-building-national-facial-recognition-database.html) software
* Activity 34: the technology behind [facial recognition](https://digitalcareers.csiro.au/en/Resources/CTIAworksheets)
* Activity 35: data is the new oil
* Activity 36: research and writing
* Activity 37: [Google trends](https://trends.google.com/trends/?geo=AU)
* Activity 38: [How does Google use cookies? (4:29)](https://youtu.be/TBR-xtJVq7E)
* **Activity 39: data fallacies**
* Activity: [Every step you take](https://apps.bostonglobe.com/business/graphics/2018/07/foot-traffic/).

Activities are completed individually by students and unpacked through class discussion. | Students activiely contribute to the hypothetical debate.Students complete workbook activities.Students begin to identify data fallacies.Students use the nomenclature in data analysis scenarios. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Extension: students could be asked to consider the difference between the microchip hypothetical and the use of facial recognition software. |  |

### Week 8

Table – week 8 – everyone’s data lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* explore data analysis considering the perspectives of diverse groups, including Aboriginal and Torres Strait Islander Peoples, culturally and linguistically diverse people, people of different ages and gender and people with disability
* explore interests and careers in analysing data.
 | **Learning intention**Broaden my understanding of data and its use by diverse groups.**Success criteria*** I can appreciate perspectives of diverse groups.

**Teaching and learning activity**Teacher-led discussion on e**xploring data analysis considering the perspectives of diverse groups, including Aboriginal and Torres Strait Islander peoples, culturally and linguistically diverse people, people of different ages and gender and people with disability.**Students complete an activity to investigate diversity within their community and complete researching and planning:* Activity 40: [Dear Data project](http://www.dear-data.com/theproject).

[How diverse is your community?](https://www.sbs.com.au/news/creative/census-explorer/xtjxeqygs?cid=news%3Asoc%3Afb%3Aen%3ANACADigital%3Acensus-explorer-snapshot%3Adb)Activity is completed individually by students and presented to the class for discussion.Teacher-led discussion on Assessment task 1.Students look at careers and data analysis, design a questionnaire and find a suitable interviewee. The interviewee is someone they know, and the questions ask how they use and interpret data in their career. | **Students create and present their own** [Dear Data project](http://www.dear-data.com/theproject) **and report on:**[How diverse is your community?](https://www.sbs.com.au/news/creative/census-explorer/xtjxeqygs?cid=news%3Asoc%3Afb%3Aen%3ANACADigital%3Acensus-explorer-snapshot%3Adb)Students complete workbook activities.Students commence work on summative Assessment task 1. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Students may require scaffolding of the terms ‘analog’ and ‘digital’ as refered to in the Dear Data project.Extension: students can also look at the [Ethical research](https://aiatsis.gov.au/research/ethical-research) webpage for **including Aboriginal and Torres Strait Islander peoples**. |  |

### Week 9

Table – week 9 – history and future lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* describe how data analysis has evolved in response to people's needs and opportunities.
 | **Learning intention**Understand how data analysis has evolved in response to people's needs and opportunities.**Success criteria*** I can retell a brief history of data analysis and make predictions about its future use.

**Teaching and learning activity**Teacher-led discussion on how data analysis has evolved in response to people's needs and opportunities.Students complete a variety of activities that focus on the evolution of data analysis.* Activities 41–43: jigsaw model, storyboard and timeline video.

Activities are completed individually by students and unpacked through class discussion. | Students contribute to the creation of a video timeline about the history of data analysis.Students make a prediction about the future uses of data analysis.Students complete workbook activities. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Extension: these activities could be developed into a class video with 7 teams, each responsible for one of the significant events provided. |  |

### Week 10

Table – week 10 – visualisation lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* explore design principles and issues relevant to analysing data, including visualisation principles, data trails and ownership of data
* access and restrict historical data or track users to customise advertising with browser cookies
* research Indigenous Cultural and Intellectual Property (ICIP) or onselling of databases to third parties.
 | **Learning intention**Understand data analysis issues including visualisation principles, data trails and ownership of data.**Success criteria*** I can explain data analysis issues, including visualisation principles, data trails and ownership of data.

**Teaching and learning activity**Teacher-led discussion on exploring design principles and issues relevant to analysing data, including visualisation principles, data trails and ownership of data.Students complete a variety of activities that focus on visualisation principles, data trails and ownership of data in the workbook:* Activity 44: [information is beautiful](https://informationisbeautiful.net/data/)
* Activity 45: visualisation principles
* Activity 46: [visualisation of data breaches](https://informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/)
* Activity 47: Data Trails
* Activity 48: [spurious correlations](https://www.tylervigen.com/spurious-correlations)
* Activity 49: [ownership of data](https://demarco.com.au/de-marco-thinks/2018-2019/intellectual-property-law-in-the-internet-of-things-who-owns-data)

Activities are completed individually by students and unpacked through class discussion. | Students explore visualisation principles, data trails and ownership of data.Students complete workbook activities.Students sumbit Assessment task 1 for summative feedback. | This section is also for use in school when making adjustments to support all students to achieve in their learning.**Students can use class journals, a webpage or a wiki to categorise interesting, newsworthy articles into cyber safety, cybersecurity, privacy and ethics folders. These tasks could be allocated according to student interest.** |  |

### Week 11

Table – week 11 – ethics lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* collect and interpret data adhering to privacy and cybersecurity principles
* investigate issues with the use of data, including cyber safety, security, privacy and ethics
* breach of copyright
* onselling of databases to third parties
* storing online payment details, such as credit card numbers
* sharing personal identifier details, such as age, address, gender, geolocation, MAC (media access control) address.
 | **Learning intention**Understand how to collect and interpret data adhering to privacy and cybersecurity principles.**Success criteria*** I can explain data analysis issues, including visualisation principles, data trails and ownership of data.

**Teaching and learning activity**Teacher-led discussion investigating issues with the use of data, including cyber safety, security, privacy and ethics.Students complete a variety of activities that focus on cyber safety, security, privacy and ethics:* Activity 50: [ethics, morality and the law (5:13)](https://www.youtube.com/watch?v=Xki2fRA0bY8)
* Activity 51: cyber safety, security, privacy and ethics
* Activity 52: [collecting data](https://ia.acs.org.au/content/ia/article/2022/google-fined--60m-for-collecting-location-data.html?ref=newsletter&deliveryName=DM14704) issues
* Activity 53: cybersecurity
* Activity 54: implications
* Activity 55: [Minecraft exercises](https://education.minecraft.net/en-us/lessons/cybersafe-home-sweet-hmm)
* Activity 56: examining privacy concerns.

Activities are completed individually by students and unpacked through class discussion. | Students complete workbook activities.Students can explain common cyber safety, security, privacy and ethical issues. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Students may choose another dataset they have collected from previous class activities, including handball tournament, [sports data [DOC 504 KB]](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/elective-courses/media/documents/Critical-thinking-option-4-strategies-and-innovations-in-sports-the-path-to-victory.docx), traffic watch, Fitbits, surveys or weather station. |  |

### Week 12

Table – week 12 – spreadsheets lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01CT5-THI-01Content:Students:* represent and store data to facilitate computation, including selecting appropriate data types, understanding data type limitations and structuring data systematically.
 | **Learning intention**Understand how data is stored and represented to facilitate computation.**Success criteria*** I can identify and select appropriate data types and structure data systematically.

**Teaching and learning activity**Teacher-led discussion on how to represent and store data to facilitate computation, including selecting appropriate data types:* Activity 57: appropriate data types
* Activity 58: data limitations
* Activity 59: data dictionary.

Teachers provide students with a walk through of [Excel Training Videos](https://support.office.com/en-us/article/excel-for-windows-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb?wt.mc_id=otc_home&ui=en-US&rs=en-US&ad=US&clearCache=104f6e1-9f9c-be36-46e4-b0b8b40c8b5) or [Get started with Google Sheets](https://edu.google.com/teacher-center/products/sheets/?modal_active=nonects/details?key=ahpzfmd3ZWItZWR1LXRyYWluaW5nLWNlbnRlcnIXCxIKRWR1UHJvZHVjdBiAgICItr7HCAw&clearCache=6c3c6056-5823-e4a6-c48e-2e7fc50df47c) and [3 Essential Excel skills for the data analyst (18:01)](https://youtu.be/I1XeDS-GLbg).Students create a data dictionary and identify and describe the data types used. | Students enter their Dear Data collection into a spreadsheet.Students record evidence of their walkthrough of [Excel training videos](https://support.office.com/en-us/article/excel-for-windows-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb?wt.mc_id=otc_home&ui=en-US&rs=en-US&ad=US&clearCache=104f6e1-9f9c-be36-46e4-b0b8b40c8b5) or [Get started with Google Sheets](https://edu.google.com/teacher-center/products/sheets/?modal_active=nonects/details?key=ahpzfmd3ZWItZWR1LXRyYWluaW5nLWNlbnRlcnIXCxIKRWR1UHJvZHVjdBiAgICItr7HCAw&clearCache=6c3c6056-5823-e4a6-c48e-2e7fc50df47c).Students can recount the [3 Essential Excel skills for the data analyst (18:01)](https://youtu.be/I1XeDS-GLbg).Students create a data dictionary and identify and describe the data types used. | This section is also for use in school when making adjustments to support all students to achieve in their learning.**Class journals, wikis or Google Sites can be used to categorise interesting, newsworthy articles into cyber safety, cybersecurity, privacy and ethics folders. These tasks could be allocated according to student interest.** | N |

### Week 13

Table – week 13 – database lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01CT5-COM-01CT5-DAT-02Content:Students:* model entities, events and their attributes using structured data
* model the relationships between entities and events using relational data
* compare the usability of data using a spreadsheet or database to analyse the same dataset
* analyse data in both a flat-file and relational database using queries and reports
* generate alternative designs and evaluate them against the requirements to select a preferred design.
 | **Learning intention**Understand how data is structured in databases and spreadsheets.**Success criteria*** I can model entities, events, and attributes.
* I can compare spreadsheets to databases.
* I can create queries and reports.
* I can model entities, events and their attributes using structured data.
* I can model entities, events and their relationships using relational data.
* I can compare the usability of data using a spreadsheet or database to analyse the same dataset.
* I can analyse data in both a flat-file and relational database using queries and reports.

**Teaching and learning activity**Teacher-led discussion on how to represent and store data to facilitate computation, including selecting appropriate data types.Teacher-led discussion on how to identify and describe data type limitations and structure data systematically.Students complete a variety of activities that focus on using databases in the workbook: * Activities 60–65: library book borrowing
* Activity 66: entities, attributes and events
* Activities 67–69: database and a [cline](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/566) with a database on one end and a spreadsheet on the other
* Activities 70– 72: queries and reports.

Activities are completed individually by students and unpacked through class discussion. | Students complete workbook activities.Students can examine their library database and the components within this system.Students analyse data in both a flat-file and relational database creating queries and reports. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Database scenarios can be most engaging when they tap into student interest.Students may choose to make a database to register players for a team, club, hobby or interest group.Students that have some experience in using Python may wish to use [Pandas and Colab](https://helloworld.raspberrypi.org/articles/hw16-pandas-for-absolute-beginners).These are powerful data analysis tools that provide an introduction to concepts explored in Stage 6. |  |

### Week 14

Table – week 14 – machine learning lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-EVL-01CT5-DAT-01Content:Students:* explore design principles and issues relevant to analysing data, including visualisation principles, data trails and ownership of data
* access and restrict historical data or track users to customise advertising with browser cookies
* research Indigenous Cultural and Intellectual Property (ICIP) or onselling of databases to third parties.
 | **Learning intention**Understand the concept of machine learning.**Success criteria*** I can explain what machine learning is.
* I can train and test a classifier.

**Teaching and learning activity**Teacher-led discussion on machine learning.Students complete a variety of activities that focus on machine learning in the workbook:* Activity 73: [What is machine learning? (3:28)](https://royalsociety.org/topics-policy/projects/machine-learning/videos-and-background-information/)
* **Activity 74:** teachable machine ([Teachable Machine 1: Image Classification (20:01)](https://www.youtube.com/watch?v=kwcillcWOg0&list=PLRqwX-V7Uu6aJwX0rFP-7ccA6ivsPDsK5) and [Teachable Machine](https://teachablemachine.withgoogle.com/))
* Activity 75: [Machine Learning and Artificial Intelligence (11:50)](https://www.youtube.com/watch?v=z-EtmaFJieY)
* Activity 76: machine learning and Aboriginal perspectives ([A powerful tool posing critical questions](https://algorithm.data61.csiro.au/ai-indigenous-knowledge-a-powerful-tool-posing-critical-questions/)).

Activities are completed individually by students and unpacked through class discussion.Teacher-led discussion on Assessment task 2.Students look at creating their own data or using a dataset to create visualisations and documentation of the steps involved in creating their system. | Students complete the workbook activities and teachable machine activities.Students commence work on summative Assessment task 2. | This section is also for use in school when making adjustments to support all students to achieve in their learning.**Extension: students survey each other’s movie preferences and provide a thumbs up of each other’s choices then figure out what recommendations to make to their ’nearest neighbour‘ friends.****This is detailed in the video:** [How Recommender Systems Work (Netflix/Amazon) (8:17)](https://www.youtube.com/watch?app=desktop&v=n3RKsY2H-NE). |  |

### Weeks 15–18

Table – weeks 15–18 – producing and implementing lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-DPM-01CT5-DAT-01CT5-COM-01CT5-THI-01CT5-DAT-02Content:Students:* develop a digital solution using a range of software to interpret and represent data to create information for a real-world scenario
* specify what data is collected, who owns it and how it will be protected
* document the design and implementation of the solution in a project notebook
* use appropriate methods to collect, store, validate and verify qualitative and quantitative data, considering data integrity and privacy and personally identifying information (PII)
* summarise data using formulas, functions and features of a spreadsheet, including complex formulas, aggregate functions and lookup functions
* filter, group and sort data using a spreadsheet, including using filters and sorting, using conditional formatting and grouping and aggregating data
* present data and make predictions and decisions using a spreadsheet, including creating a data dashboard or report in a spreadsheet, decision formulas and optimisation
* analyse data to make decisions and generate reports using a database
* load, insert and update data in a database
* generate a data visualisation to identify trends and outliers using a range of tools
* select and use specialist terminology in context
* create a record of project development demonstrating iterative design and evaluation.
 | **Learning intention**Work to produce and implement a project over 3 weeks.Show how data analysis can be used to answer questions and solve real-world problems.Develop a digital solution using a range of software to interpret and represent data to create information for a real-world scenario.Manage, document and explain work practices during development of the project.Use an iterative approach and apply computational, design and systems thinking to the solution.Develop and apply test criteria for components of a mechatronic and/or automated system.**Success criteria*** I can create a digital solution using data analysis to a real-world problem.
* I can select and use specialist terminology.
* I have the skills to create a record of project development and manage a project using an iterative approach.

**Teaching and learning activity**Teacher provides an overview of the skills and timeline in producing and implementing their project:* Activity 77: developing an idea.

Students complete the [jigsaw activity](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/546) to revisit one or more of the scenarios studied during this unit.Students explore the [GovHack](https://govhack.org/) scenarios.Teacher explains the context of the project is to investigate a real-world problem or need, including breaking the system down into manageable parts and interviewing stakeholders to identify their needs.**Students research, create and record the development of a digital solution that requires the collection, analysis and visualisation of data to showcase a real-world problem or opportunity.**Teacher-led discussion on problem solving techniques and recording all aspects of the development in the record of project development.Further knowledge acquired may see students redevelop their initial idea and seek advancement from their proposed concept.Students assess what they know, what they need to know and how they might bridge any gaps in understanding that exist.Students record steps through the project in their record of project development or [Learning portfolio](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/583).**Students produce a presentation of their data analysis to persuade the audience with data transformed into information for a real-world problem or opportunity.**The solution may take any digital form including:* a social media awareness, education or advocacy campaign
* a prototype proposal for an app
* a webpage or wiki
* an interactive report.

The problem may be personal, school based, local, regional, national or global.Each student or team collects and/or sources datasets to analyse and visualise into information used to drive decisions, answer questions and inform the proposed solution.Datasets are analysed using software tools to create data visualisations.Students represent and store data to facilitate computation, including selecting appropriate data types, understanding data type limitations and structuring data systematically.Students summarise data using formulas, functions and features of a spreadsheet, including complex formulas, aggregate functions and lookup functions.Students filter, group and sort data using a spreadsheet, including using filters and sorting.Students use present data to make predictions and decisions using a spreadsheet, including creating a data dashboard or report in a spreadsheet, with decision formulas and optimisation.Students load, insert and update data in a database.Students model entities, events and their attributes using structured data.Students model the relationships between entities and events using relational data. | Students work individually and collaboratively on Assessment task 2 under the guidance of their teacher.Students receive ongoing formative feedback and summative feedback through Assessment task 2.Students identify, list and describe:* the real-world problems or questions that the data scenarios address
* the essential parts (inputs, processes and outputs) of the scenario
* the people that use the results of the analysis.

Students identify the datasets required to solve the examples of real-world problems.Students choose or are assigned a real-world problem that requires data analysis to develop a digital solution.Students record their key learning events or activities using a procedural recount called the record of project development.Students demonstrate the impact of work practices by making judgments about what has happened and what they still need to understand. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Provide visual and/or multimedia examples and check understanding of concepts.Ensure all students understand both technical and culturally based terms.Message abundancy may be useful when introducing new terminology. The word is spoken, written on the board, represented by visuals.Include multiple opportunities to respond, for example:* verbally
* individually
* partner turn and talk.
* non-verbally
* gesture
* response cards
* options of real-world scenarios related to their interests to increase engagement.
 |  |

### Week 19

Table – week 19 – testing and evaluating lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-COM-01CT5-THI-01CT5-DAT-02Content:Students:* evaluate tools and processes used in the analysis of data for validation
* evaluate sourced data processed using the 3Vs: volume, variety and velocity.
 | **Learning intention**Evaluate tools and processes used in the analysis of data for validation.Evaluate sourced data processed using the 3Vs: volume, variety and velocity.**Success criteria*** I can use data validation tools and processes when testing and evaluating.
* I can perform verification of datasets, calculations and outputs.
* I can identify the differences between small and big datasets using the 3Vs.
* I can evaluate multiple projects.

**Teaching and learning activity**Teacher-led discussion on the importance of testing and evaluating.Students complete a variety of activities that focus on testing and evaluating in the workbook:* Activity 78: data validation. Students use the data validation tools within the spreadsheet.
* Activity 79: 3Vs: volume, variety and velocity.

Students describe one of the big datasets from this unit in terms of the 3Vs from the list below:* [Census](https://www.abs.gov.au/census)
* [BoM (Bureau of Meteorology)](http://www.bom.gov.au/)
* [IWK (Indigenous Weather Knowledge)](http://www.bom.gov.au/iwk/)
* [National Map](https://nationalmap.gov.au/)
* [Open Data Hub](https://opendataforum.transport.nsw.gov.au/).

These activities could be delivered concurrently with the development of the digital solution in Assessment task 2. | Students use data validation tools and processes when testing and evaluating.Students perform verification of datasets, calculations and outputs.Students can identify the differences between small and big datasets using volume, variety and velocity. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Include multiple opportunities to respond, for example:* verbally
* individually
* partner turn and talk.
* non-verbally
* gesture
* response cards.
 |  |

### Week 20

Table – week 20 – testing and evaluating lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| Outcomes:CT5-COM-01CT5-THI-01CT5-DAT-02Content:Students:* evaluate their own project and that of their peers using predetermined functional and non-functional requirements
* evaluate whether solutions meet social, ethical and legal responsibilities and cybersecurity principles
* assess a developed solution based on calculations from datasets
* perform verification of datasets, calculations and outputs.
 | **Learning intention:**Evaluate my own project and that of peers using predetermined functional and non-functional requirements.Evaluate whether solutions meet social, ethical and legal responsibilities and cybersecurity principles.Assess a developed solution based on calculations from datasets.**Success criteria:*** I can determine the success of a project based on how it meets functional and non-functional requirements.
* I can determine whether solutions meet social, ethical and legal responsibilities, as well as cybersecurity principles.
* I check that calculations on datasets have been used accurately.

**Teaching and learning activity**Teacher explains to the class that students will showcase their final project and go through self and peer review.Students participate in self and peer review through a showcase of student projects looking at the functional and non-functional requirements of the project.Students can be guided to give [peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549).Students create a presentation for the project evaluation and present the key information of their data analysis. Their presentation may take the form of a pitch or be a video.Students present their project evaluation to the class and receive feedback.During the presentation of their digital solution, students evaluate their own and each other’s project based on:* the criteria of functional and non-functional requirements they proposed
* whether solutions meet social, ethical and legal responsibilities and cybersecurity principles
* calculations from the datasets they have used (including formulas, aggregate and lookup functions, trends and outliers).
 | Students can evaluate their own project and that of their peers against functional and non-functional requirements.Students can showcase their complete project, discussing their self-assessment.Student evaluations can be achieved using [peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549) and form part of the summative assessment of this unit.Students can accurately determine whether solutions meet social, ethical and legal responsibilities, as well as cybersecurity principles.Students can check that calculations on datasets have been used accurately. | This section is also for use in school when making adjustments to support all students to achieve in their learning.Pre-teach strategies to students on how to peer assess.Provide visual and/or multimedia examples and check understanding of concepts.Include multiple opportunities to respond, for example:* verbally
* individually
* partner turn and talk
* non-verbally
* gesture
* response cards.
 |  |

## Additional information

For additional support or advice, contact the [subject] curriculum team by emailing TAS@det.nsw.edu.au.

### Further implementation support

Curriculum design and implementation is a dynamic and contextually-specific process. The department is committed to supporting teachers to meet the needs of all students. The advice below on assessment and planning for the needs of every student may be useful when considering the material presented in this sample program of learning.

### Assessment for learning

Possible formative assessment strategies that could be included:

* **Learning intentions** and **success criteria** assist educators to articulate the purpose of a learning task to make judgements about the quality of student learning. These help students focus on the task or activity taking place and what they are learning, and provide a framework for reflection and feedback. [Online tools](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622) can assist implementation of this formative assessment strategy.
* Eliciting evidence strategies allow teachers to determine the next steps in learning and assist teachers in evaluating the impact of teaching and learning activities. Strategies that may be added to a learning sequence to elicit evidence include all student response systems, [exit tickets](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/543), mini whiteboards (actual or [digital](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/575)), [hinge questions](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/560), [Kahoot](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/621), [Socrative](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/587), or quick quizzes to ensure that individual student progress can be monitored and the lesson sequence adjusted based on formative data collected.
* Feedback is designed to close the gap between current and desired performance by informing teacher and student behaviour (AITSL 2017). AITSL provides a [factsheet to support evidence-based feedback](https://www.aitsl.edu.au/teach/improve-practice/feedback#:~:text=FEEDBACK-,Factsheet,-A%20quick%20guide).
* [Peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549) is a structured process where students evaluate the work of their peers by providing valuable feedback in relation to learning intentions and success criteria. It can be supported by [online tools](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Browser?cache_id=1d29b).
* Self-regulated learning opportunities assist students in taking ownership of their own learning. A variety of strategies can be employed and some examples include reflection tasks, [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645), [KWLH charts](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/562), [learning portfolios](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/583) and [learning logs](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/583).

The primary role of assessment is to establish where individuals are in their learning so that teaching can be differentiated and further learning progress can be monitored over time.

Feedback is one of the most powerful influences on student achievement. Feedback that focuses on improving tasks, processes and student self-regulation is the most effective. Students engaging with feedback can take many forms including formal, informal, formative, summative, interactive, demonstrable, visual, written, verbal and non-verbal. [What works best update 2020](https://education.nsw.gov.au/about-us/educational-data/cese/publications/research-reports/what-works-best-2020-update) (CESE 2020a)

### Differentiation

Differentiated learning should be enabled by differentiating the teaching approach to content, process, product and the learning environment. For more information on differentiation go to [Differentiating learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/teacher-quality-and-accreditation/strong-start-great-teachers/refining-practice/differentiating-learning) and [Differentiation](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/primary-school/teaching-strategies/differentiation).

When using these resources in the classroom, it is important for teachers to consider the needs of all students in their class, including:

* **Aboriginal and Torres Strait Islander students.** Targeted [strategies](https://education.nsw.gov.au/teaching-and-learning/aec/aboriginal-education-in-nsw-public-schools) can be used to achieve outcomes for Aboriginal students in K-12 and increase knowledge and understanding of Aboriginal histories and culture. Teachers should use students’ Personalised Learning Pathways to support individual student needs and goals.
* **EAL/D learners.** EAL/D learners will require explicit English language support and scaffolding, informed by the [EAL/D enhanced teaching and learning cycle](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/eald/enhanced-teaching-and-learning-cycle) and the student’s phase on the [EAL/D Learning Progression](https://education.nsw.gov.au/teaching-and-learning/curriculum/multicultural-education/english-as-an-additional-language-or-dialect/planning-eald-support/english-language-proficiency). In addition, teachers can access information about [supporting EAL/D learners](https://education.nsw.gov.au/teaching-and-learning/curriculum/multicultural-education/english-as-an-additional-language-or-dialect/teaching-and-learning#Differentiation2) and [literacy and numeracy support specific to EAL/D learners](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/eald).
* **Students with additional learning needs.** Learning adjustments enable students with disability and additional learning and support needs to access syllabus outcomes and content on the same basis as their peers. Teachers can use a range of [adjustments](https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/personalised-support-for-learning/adjustments-to-teaching-and-learning) to ensure a personalised approach to student learning. Subject specific curriculum considerations can be found on the [Inclusive Practice hub](https://education.nsw.gov.au/campaigns/inclusive-practice-hub).
* **High potential and gifted learners.** [Assessing and identifying high potential and gifted learners](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/assess-and-identify#Assessment1) will help teachers decide which students may benefit from extension and additional challenge. [Effective strategies and contributors to achievement](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/evaluate) for high potential and gifted learners helps teachers to identify and target areas for growth and improvement. In addition, the [Differentiation Adjustment Tool](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/implement/differentiation-adjustment-strategies) can be used to support the specific learning needs of high potential and gifted students. The [High Potential and Gifted Education Professional Learning and Resource Hub](https://schoolsnsw.sharepoint.com/sites/HPGEHub/SitePages/Home.aspx) supports school leaders and teachers to effectively implement the High Potential and Gifted Education Policy in their unique contexts.

All students need to be challenged and engaged to develop their potential fully. A culture of high expectations needs to be supported by strategies that both challenge and support student learning needs, such as through appropriate curriculum differentiation. [What works best update 2020](https://policies.education.nsw.gov.au/content/dam/main-education/about-us/educational-data/cese/wwb-what-works-best-2020-update.pdf) (CESE 2020a:6)

### Support and alignment

**Resource evaluation and support:** all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance and effectiveness. For additional support or advice, contact the TAS curriculum team by emailing TAS@det.nsw.edu.au.

**Alignment to system priorities and/or needs:** [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468), [School Success Model.](https://education.nsw.gov.au/public-schools/school-success-model/school-success-model-explained)

**Alignment to the School Excellence Framework:** this resource supports the [School Excellence Framework](https://education.nsw.gov.au/teaching-and-learning/school-excellence-and-accountability/sef-evidence-guide/resources/about-sef) elements of curriculum (curriculum provision) and effective classroom practice (lesson planning, explicit teaching).

**Alignment to Australian Professional Teaching Standards:** This resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards/proficient-teacher) 3.2.2, 3.3.2.

**Consulted with:** Curriculum and Reform, Inclusive Education, Multicultural Education, Aboriginal Outcomes and Partnerships and subject matter experts.

**NSW syllabus:** Computing Technology 7–10

**Syllabus outcomes: CT5-DPM-01, CT5-EVL-01, CT5-DAT-01, CT5-COM-01, CT5-THI-01, CT5-DAT02.**

**Author:** TAS, Curriculum Secondary Learners, Curriculum Reform

**Publisher:** State of NSW, Department of Education

**Resource:** Program of learning

**Related resources:** further resources to support Computing Technology 7–10 can be found on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

**Professional learning:** relevant professional learning is available through the TAS statewide staffroom.

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## Evidence base

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