**Australian Curriculum:
Digital Technologies**

**Years 7–8**

**Sample assessment task**
**Controlling the classroom learning environment**

To be read with the *Student activity guide: Investigating environmental data with micro:bits*

**Assessment focus:** Australian Curriculum:Digital Technologies

(digital systems)

About this assessment task

This sample assessment task has been prepared to assist teachers with the implementation of the Australian Curriculum: Digital Technologies, with a focus on *digital systems*. It shows how aspects of the Digital Technologies curriculum related to digital systems can be assessed using contexts from other learning areas and subjects. These contexts may be content that students have recently completed or are learning concurrently. This approach should enhance the manageability of the curriculum while still providing a targeted focus on Digital Technologies.

Purpose

The sample task aims to:

* demonstrate meaningful curriculum links to:
* Digital Technologies curriculum:
	+ - achievement standard
		- content descriptions
		- content strands
		- key concepts
		- key ideas (Technologies)
* general capabilities
* cross-curriculum priorities
* other learning areas. See Appendix 1 for specific links for this task.
* provide teacher support materials, suggested adjustments for students with diverse needs and resources. See Appendix 2.
* provide a template to create your own assessment task. See Appendix 3
* provide the *Student activity guide*: *Investigating environmental data with micro:bits* which includes detailed instructions for students as they work through the task.

How to use this sample task

The sample task can be implemented as a standalone task or it can be used to inform planning
of a:

* unit of work that might accompany the sample task
* similar task or unit of work with a focus on digital systems.

Title: Controlling the classroom learning environment

**Assessment focus:** Australian Curriculum: Digital Technologies (Digital systems – recognising and exploring digital systems to collect and analyse data to inform decisions). This task is also linked to Science. Depending on modifications made, opportunities may exist to link this task to Mathematics and/or English.

**Band:** Years 7 and 8

**Context:** Digital Technologies and Science – Environmental sustainability and systems

**Duration:** Dependent on how the task is to be implemented – up to a term-long unit

**Prior learning:** Students will have:

* had some exposure to block coding
* used some digital devices (e.g. Arduino, EV3 Lego, micro:bit, Ozobot, Sphero) in combination with computer hardware such as laptops or desktop computers
* had some exposure to charting tools such as a spreadsheet.

Task summary

**Key inquiry question**

How can we determine if our classroom environment is at a level conducive to optimal learning?

**Focus questions**

* What environmental factors contribute to optimal learning?
* How can we measure environmental factors in our school?

Discuss with students the need for learning environments to be designed and able to function with conditions conducive to learning being taken into account. There is a growing body of evidence indicating that environmental conditions play an important role in making the learning environment effective or ineffective. These conditions include such things as noise level, lighting level, temperature level, CO2 level, particulate level and so on (look at teacher guidance and support below for links to relevant research). Students will undertake activities that will allow them to measure the classroom environment for some of the factors listed above. By creating and coding digital systems, students will collect data as evidence and determine ways to make their environment more optimal for learning. Students will use their knowledge of digital systems to create monitoring systems that alert the users when conditions fall below acceptable levels. This digital system together with the students’ planned solutions will be presented in some format to key stakeholders.

Students will:

* research optimal levels of a variety of environmental factors for an educational setting
* create digital systems (integrated or extended) which monitor environmental factors and provide relevant data
* create mechanisms within the systems that provide feedback to the students related to the environmental condition/s being monitored
* design and create algorithms that explain the computational thinking and logic of their created digital systems
* implement the digital systems using block based or general-purpose programming languages
* determine thresholds for the digital systems and have the systems alert the users in some way when thresholds have been crossed
* identify solutions and put procedures in place to remedy environmental conditions that are not conducive to learning
* document findings and solutions in a format that is open to the student to choose.

Task features

Students will be asked to complete the following activities. (Initial activities can be completed as a whole class. As students progress, subsequent activities can be completed in small groups or individually depending on the amount of equipment available.)

While these activities can be done using a variety of microcontrollers (Arduino, micro:bit, Raspberry Pi etc.) this document will concentrate on using micro:bits only.

* Identify environmental factors that affect learning.
* Experiment with micro:bits to collect data using in-built sensors.
* Graph collected data based on varying time intervals.
* Experiment with micro:bits to collect data using external sensors.
* Graph collected data based on time intervals.
* Incorporate actuators (LEDs or buzzers) to provide feedback to the students regarding environmental conditions.
* Create digital systems that monitor and report on a variety of environmental conditions simultaneously.
* Create a report which documents the students’ findings and proposed solutions to various environmental conditions in their learning environments.
* Present the report to stakeholders such as staff, other classes, parent body or
school executive.

Background information

**Teacher guidance and support**

* Read *Student activity guide:* *Investigating environmental data with micro:bits* and follow the links in order to understand the background to the tutorials and what underpins the activities.
* Collect the necessary resources – this task needs a microcontroller and some peripherals per group. You could just choose the activities that suit the equipment you have.
* Determine the path that the students will take (this could be following the block code approach, the Python approach (as an example) or a combination of the 2). Your students’ current level of understanding should inform this decision.
* Present each of the activities in turn. They are designed to build on knowledge gained in the previous tutorial so a systematic approach is suggested.
* Each activity contains links to short videos further explaining and demonstrating each step in the activity. You can show these to students or just watch them yourself to help with understanding.

The suggested assessment is merely that, and students could be assessed in many other ways. Have fun with these activities – students will like them.

Links to the Australian Curriculum

Table 1 shows the related Australian Curriculum links to this task. For a more in-depth exploration of the links to the curriculum, see Appendix 1.

Table 1: Links from the task to the Australian Curriculum

|  |  |
| --- | --- |
| **Digital Technologies*****Achievement standard***Aspects addressed by this task are highlighted. | By the end of Year 8, students distinguish between different types of networks and defined purposes. They explain how text, image and audio data can be represented, secured and presented in digital systems.Students plan and manage digital projects to create interactive information. They define and decompose problems in terms of functional requirements and constraints. Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. They analyse and evaluate data from a range of sources to model and create solutions. They use appropriate protocols when communicating and collaborating online. |
| ***Strands*** | Digital Technologies knowledge and understanding * Digital systems

Digital Technologies processes and production skills * Collecting, managing and analysing data
* Creating digital solutions by:
* investigating and defining
* generating and designing
* producing and implementing
* evaluating
 |
| ***Content descriptions*** | * Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance [(ACTDIK023)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIK023)
* Acquire data from a range of sources and evaluate authenticity, accuracy and timeliness [(ACTDIP025)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP025)
* Analyse and visualise data using a range of software to create information, and use structured data to model objects or events [(ACTDIP026)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP026)
* Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints [(ACTDIP027)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP027)
* Design the user experience of a digital system, generating, evaluating and communicating alternative designs [(ACTDIP028)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP028)
* Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors [(ACTDIP029)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP029)
* Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language [(ACTDIP030)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP030)
* Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability [(ACTDIP031)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP031)
* Plan and manage projects that create and communicate ideas and information collaboratively online, taking safety and social contexts into account [(ACTDIP032)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP032)
 |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Key concepts*** | * abstraction
* data collection
* data interpretation
* specification
* algorithms
* implementation
* digital systems
* impact
 | ***Key ideas***  | Thinking in Technologies* + systems thinking
	+ computational thinking
 |
| ***Cross-curriculum priorities*** | * Sustainability
 | ***General capabilities*** | * Information and Communication Technology (ICT) Capability
* Literacy
* Numeracy
 |

Assessment planner

|  |  |
| --- | --- |
| **Achievement standard**(relevant aspect of the achievement standard to be assessed) | **Student evidence** (what student evidence will be considered to judge if the achievement standard aspect has been met) |
| **Digital Technologies** |
| * Students explain how text, image and audio data can be represented and presented in digital systems.
* They define and decompose problems in terms of functional requirements and constraints.
* Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions.
 | * Students use a lux meter app on a phone and compare its reading with the light levels produced when they program the micro:bit.
* Students explain how values in the different systems can be represented with colours or numerical values and are able to express whether light level is too dark or adequate.
* Students are able to write pseudocode and then program the micro:bit to display an image to indicate whether temperature, sound and air quality levels are optimal.
* Students explain how each image displayed on the micro:bit represents a numerical value or range of values.
 |
| * Students plan and manage digital projects to create interactive information.
 | * Students work through the activities collaboratively and create annotated diagrams and written pseudocode as they plan their interactive micro:bit solutions.
 |
| * They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability.
 | * Students are able to express how their micro:bit solutions meet needs, are innovative and how they contribute to environmental, social and economic sustainability.
 |
| * They analyse and evaluate data from a range of sources to model and create solutions.
 | * Students compare data from various apps and devices (such as the lux meter app) and their micro:bit and analyse light, temperature, sound and air quality data to model and create their micro:bit solutions.
 |

Assessment rubric

This rubric shows only Digital Technologies. **Note:** There are opportunities to include HASS, Literacy and Numeracy in the assessment.

| **Relevant sections of the achievement standard** | **Below standard****Students:** | **At standard****Students:** | **Above standard****Students:**  |
| --- | --- | --- | --- |
| **Digital systems**  | * display difficulty in getting components to perform as expected under differing conditions; experience difficulty with calibration of equipment
 | * explain how values in different digital systems can be represented with various images or numerical values and are able to express whether light level is too dark or adequate
 | * calibrate equipment accurately without assistance so that it reacts successfully to a variety of environmental stimuli in several different ways
 |
| **Data collection and interpretation** | * get data based on at least a single environmental condition, but have difficulty in applying the data in any meaningful way to a product they may be creating
 | * use a lux meter app on a phone and compare its reading with the light levels produced when they program the micro:bit
 | * use a variety of equipment to sense environmental data and inform their coding decisions for products they are producing
 |
| **Specification**  | * apply environmental levels to acceptable standards with assistance
 | * determine what light, temperature, sound and air quality levels are optimal and express parameters required for their algorithms
 | * readily apply collected environmental levels to acceptable standards based on research that they have read
 |
| **Algorithms**  | * provide plain English descriptions of some parts of a given solution
 | * write pseudocode to determine whether temperature, sound and air quality levels are optimal
 | * write algorithmic solutions to given problems using correct constructs, keywords and syntax and can alter them without help if necessary
 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Implementation**  | * get a micro:bit to display some environmental data
 | * program the micro:bit to display an image to indicate whether temperature, sound and air quality levels are optimal
 | * program a device to display various environmental conditions as well as react to those conditions through a variety of alert mechanisms
 |
| **Impact** | * articulate how a micro:bit might collect some data
 | * express how their micro:bit solutions meet needs, are innovative and how they contribute to environmental, social and economic sustainability
 | * describe extension applications of environmental systems that they have created and the impact that such systems might have on society
 |

## **Appendix 1**

## **Australian Curriculum links (in detail)**

Links to the Australian Curriculum

Digital Technologies

Achievement standard

By the end of Year 8, students distinguish between different types of networks and defined purposes. They explain how text, image and audio data can be represented, secured and presented in digital systems.

Students plan and manage digital projects to create interactive information. They define and decompose problems in terms of functional requirements and constraints. Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. They analyse and evaluate data from a range of sources to model and create solutions. They use appropriate protocols when communicating and collaborating online.

Content descriptions

|  |
| --- |
| * Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance [(ACTDIK023)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIK023)
* Acquire data from a range of sources and evaluate authenticity, accuracy and timeliness [(ACTDIP025)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP025)
* Analyse and visualise data using a range of software to create information, and use structured data to model objects or events [(ACTDIP026)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP026)
* Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints [(ACTDIP027)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP027)
* Design the user experience of a digital system, generating, evaluating and communicating alternative designs [(ACTDIP028)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP028)
* Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors [(ACTDIP029)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP029)
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* Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability [(ACTDIP031)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP031)
* Plan and manage projects that create and communicate ideas and information collaboratively online, taking safety and social contexts into account [(ACTDIP032)](http://www.scootle.edu.au/ec/search?accContentId=ACTDIP032)
 |

Content strands

|  |  |
| --- | --- |
| **Digital Technologies knowledge and understanding** | **Digital Technologies processes and production skills** |
| * Digital systems
* Representation of data
 | X  | Collecting, managing and analysing dataCreating digital solutions by:* investigating and defining
* generating and designing
* producing and implementing
* evaluating
* collaborating and managing
 | XXXXXX |

Links to the key ideas

|  |  |  |
| --- | --- | --- |
| **Creating preferred futures** | Students develop solutions to meet needs considering impacts on liveability, economic prosperity and environmental sustainability. | X |
| **Project management** | Students will develop skills to manage projects to successful completion through planning, organising and monitoring timelines, activities and the use of resources. | X |
| **Thinking in Technologies*** Systems thinking
 | Systems thinking is a holistic approach to the identification and solving of problems where the focal points are treated as components of a system, and their interactions and interrelationships are analysed individually to see how they influence the functioning of the entire system. | X |
| * Design thinking
 | Design thinking involves the use of strategies for understanding design needs and opportunities, visualising and generating creative and innovative ideas, planning, and analysing and evaluating those ideas that best meet the criteria for success. | X |
| * Computational thinking
 | Computational thinking is a problem-solving method that is applied to create solutions that can be implemented using digital technologies. It involves integrating strategies, such as organising data logically, breaking down problems into parts, interpreting patterns and models and designing and implementing algorithms. | X |

Read more about the [key ideas in the Australian Curriculum: Technologies](https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/key-ideas/).

Links to the key concepts

The [key concepts](https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies/structure/)that underpin the Digital Technologies curriculum establish a way of thinking about problems, opportunities and information systems and provide a framework for knowledge and practice. (Colour coding is based on the [Australian Computing Academy scheme](https://aca.edu.au/#what-is-the-digital-technologies-curriculum).)

|  |  |  |
| --- | --- | --- |
|  | **abstraction** | underpins all content, particularly the content descriptions relating to the concepts of data representation; and specification; algorithms; and implementation  |
|  | **data collection**  | (properties, sources and collection of data)* *Students collect and analyse environmental data.*
 | X |
|  | **data representation** | (symbolism and separation) |  |
|  | **data interpretation** | (patterns and contexts) * *Students draw conclusions from collected data.*
 | X |
|  | **specification** | (descriptions and techniques)* *Students specify what data they will collect and what problems they hope to solve such as making a learning space optimal.*
 | X |
|  | **algorithms** | (following and describing)* *Students design algorithms to collect data with their micro:bit.*
 | X |
|  | **implementation** | (translating and programming)* *Students implement and test algorithms to collect data with their micro:bit.*
 | X |
|  | **digital systems**  | (hardware, software, and networks and the internet)* *Students design digital systems that will measure environmental data.*
 | X |
|  | **interactions** | (people and digital systems, data and processes)* *Students develop an understanding of the way systems can be used to help people (ie themselves and classmates).*
* *Students design digital systems to be used by people to monitor environmental conditions to optimise learning.*
 | X |
|  | **impact** | (sustainability and empowerment)* *Students develop an understanding of how systems can help us to live and work more sustainably.*
* *Students develop an understanding of how they can design digital systems that can be used to help people.*
 | X |

## **Cross-curriculum priorities** [Read more…](https://www.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/)

|  |  |  |
| --- | --- | --- |
| **Aboriginal and Torres Strait Islander histories and cultures** | **Asia and Australia’s engagement with Asia** | **Sustainability** |
|  |  | X |

## **General capabilities** [Read more…](https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Literacy** | **Numeracy** | **ICT Capability** | **Critical and Creative Thinking** | **Ethical Understanding** | **Personal and Social capability** | **Intercultural Understanding** |
| X | X | X | X |  |  |  |

## **Links to ICT Capability continuum: Level 5**

Depending on the year level this activity is being used with, adjust content to the appropriate level;
for example, Level 4 or 6.

|  |
| --- |
| **Apply social and ethical protocols and practices when using ICT**  |
| apply practices that comply with legal obligations regarding the ownership and use of digital products resources  | X |
| independently apply strategies for determining the appropriate type of digital information suited to the location of storage and adequate security for online environments  | X |
| identify and value the rights to identity, privacy and emotional safety for themselves and others when using ICT and apply generally accepted social protocols when using ICT to collaborate with local and global communities  | X |
| explain the benefits and risks of the use of ICT for particular people in work and home environments  | X |
| **Investigating with ICT**  |
| use a range of ICT to analyse information in terms of implicit patterns and structures as a basis to plan an information search or generation  | X |
| locate, retrieve or generate information using search facilities and organise information in meaningful ways  | X |
| assess the suitability of data or information using appropriate own criteria  | X |
| **Creating with ICT**  |
| use appropriate ICT to collaboratively generate ideas and develop plans  | X |
| design and modify simple digital solutions, or multimodal creative outputs or data transformations for particular audiences and purposes following recognised conventions  | X |
| **Communicating with ICT**  |
| select and use appropriate ICT tools safely to lead groups in sharing and exchanging information, and taking part in online projects or active collaborations with appropriate global audiences  | X |
| understand that there are various methods of collaboration through computer mediated communications that vary in form and control  | X |
| **Managing and operating ICT**  |
| independently select and operate a range of devices by adjusting relevant software functions to suit specific tasks, and independently use common troubleshooting procedures to solve routine malfunctions  | X |
| identify and compare networked ICT system components including between hardware, software and data  | X |
| manage and maintain data for groups of users using a variety of methods and systems  | X |

## **Links to Literacy**

In this Years 7 and 8 Digital Technologies task, students have the opportunity to develop literacy by comprehending texts through listening, reading and viewing; composing texts through speaking, writing and creating; and using text and word knowledge. They practise literacy skills as they navigate, read and review subject-specific texts; listen to instructions and to identify, respond to and interpret information and opinions; compose and edit learning area texts; use language to interact with others; and deliver presentations. As students explain components of digital systems and representation of data, and give presentations, they apply their developing knowledge of the structure and features of learning area texts to comprehend and compose a range of more complex texts for identified purposes; and use subject-specific vocabulary including words that express shades of meaning.

Visit Literacy general capability <https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/literacy/>

Visit National Literacy Learning Progression <https://www.australiancurriculum.edu.au/resources/national-literacy-and-numeracy-learning-progressions/national-literacy-learning-progression/>

## **Links to Numeracy**

In this Years 7 and 8 Digital Technologies task, students have the opportunity to develop numeracy by estimating and calculating with whole numbers, and recognising and using patterns and relationships. In exploring how digital systems represent data students solve problems and check calculations using efficient mental and written strategies; use raw data to calibrate devices to provide data that is meaningful and identify and describe pattern rules and relationships that help to identify trends.

Visit Numeracy general capability <https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/>

Visit National Numeracy Learning Progression <https://www.australiancurriculum.edu.au/resources/national-literacy-and-numeracy-learning-progressions/national-numeracy-learning-progression/>

Links to other learning areas

|  |
| --- |
| **Science** |
| **Year 7**By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth’s gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. They explain possible implications of the solution for different groups in society.Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.**Year 8**By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the timescales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems. They reflect on implications of these solutions for different groups in society.Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.**Content descriptions****Year 8 Science understanding*** Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

**Years 7 and 8 Science as a human endeavour*** Scientific knowledge has changed peoples’ understanding of the world and is refined as new evidence becomes available (ACSHE119, ACSHE134)
* Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223, ACSHE226)
* Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120, ACSHE135)
* People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121, ACSHE136)

**Years 7 and 8 Science inquiry skills*** Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124, ACSIS139)
* Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125, ACSIS140)
* Measure and control variables, select equipment appropriate to the task and collect data with accuracy (ACSIS126, ACSIS141)
* Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS129, ACSIS144)
* Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130, ACSIS145)
* Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements (ACSIS131, ACSIS146)
* Use scientific knowledge and findings from investigations to evaluate claims based on evidence (ACSIS132, ACSIS234)
* Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133, ACSIS148)
 |

## **Appendix 2**

## **Support materials**

## Things to think about

 *Rich questions and discussion starters*

Students with diverse needs

## **Resources**

Support materials

Things to think about

We are ultimately responsible for our own learning. Being able to make the learning conditions optimal is very beneficial to us. Empowering students to optimise their learning conditions gives them further skills to solve authentic problems with digital solutions.

## **Rich questions and discussion starters**

**Key inquiry question**

How can we determine if our classroom environment is at a level conducive to optimal learning?

**Focus questions**

* What environmental factors contribute to optimal learning?
* How can we measure environmental factors in our school?

**Some discussion starters could be:**

* Are you able to concentrate on an essay while listening to loud music?
* Can a stuffy room really make my mind foggy? How does that affect my learning? Professor Trelawney’s divination classroom at Hogwarts was optimal for learning. Discuss with examples.
* Can lighting really affect the brain’s ability to focus? How does 6 months of darkness affect pupils in high latitude environments?
* Why do delivery personnel carry CO2 monitors with them when stocking large fridges?

**During the teaching and learning cycle, sample questions could include:**

**Comprehension**:

* What would be an example of an environmental monitoring system? (Illustrating)

**Application**:

* How can you use a micro:bit to find out how much light is in our classroom?

**Analysis**:

* What are the ideal environmental levels for learning?
* How can we determine which is better for learning – high light levels or low CO2?

**Synthesis:**

* How can an awareness of the environmental conditions of our classroom be synthesised into an environment that is optimal for learning through the use of a device such as a micro:bit?

**Evaluation:**

* How would you judge the accuracy or validity of the data we have collected via a micro:bit?
* How would you determine the effectiveness of introducing micro:bits into a classroom to monitor the environmental conditions?

**Creative thinking:**

* What could be invented to make learning environments optimal?
* What can we do to increase the conditions in our classroom to optimise learning?
* Where else would such environmental monitoring be of use to individuals or society?
* What other environmental factors could be monitored within the classroom?

## **Students with diverse needs**

Students may need **scaffolded support materials**. Adjustments to this task might include:

* placing students in groups with students who can support them with encouraging questions and ideas during the analysis and design phase
* grouping students with peer mentors who can support their literacy or numeracy needs (including training students who find the task too easy to be effective peer mentors)
* having students with literacy support needs answer questions using video or recorded voice rather than writing or typing
* using teacher assistants to support literacy demands of a task to enable student to show evidence of digital technologies learning
* encouraging students to communicate via online secure chat for those who rarely speak up during group work
* checking in at frequent intervals to determine student’s understanding of the task
* focusing on what a student can do rather than what they cannot do when providing feedback.

Use professional judgement to provide rapid support when students are struggling with a task due to its literacy or numeracy demands.

Students might need opportunities for **extension**. Adjustments for such students might include:

* the use of other microcontrollers to collect data on temperature fluctuations and other environmental conditions in different areas in the school and for applications other than learning, for example a smart garden
* designing and implementing digital survey tools to survey members of the school community about their learning environment
* training in mentorship and opportunities to support other students with encouraging questions and ideas.

**Change the approach** to delivery of this task if a student is disengaged or is finding activities too easy or too hard; adopt a different approach to teaching the same aspect of literacy or numeracy.

See also: [evidenceforlearning.org.au/guidance-reports/improving-literacy-in-secondary-schools/](https://evidenceforlearning.org.au/guidance-reports/improving-literacy-in-secondary-schools/)

Resources

* *Student activity guide: Investigating environmental data with micro:bits*

## **Useful weblinks**

Find out more about the micro:bit [www.microbit.org](http://www.microbit.org/)

* Code the micro:bit at [www.makecode.org](http://www.makecode.org/)
* Block code within MakeCode: <https://makecode.microbit.org/>

Find out more about variables:

* <https://makecode.microbit.org/blocks/variables/var>
* <https://makecode.microbit.org/courses/csintro/variables>

Teachers or students wishing to explore these activities in a general-purpose programming language including Python and MicroPython:

* Code in Python inside MakeCode: <https://python.microbit.org/v/1.1>
* Python for beginners: <https://www.python.org/about/gettingstarted/>
* Code in MicroPython with Mu editor. Download site: <https://codewith.mu/en/download>
* Learnometer research website: [learnometer.net/](http://www.learnometer.net/)
* Learnometer commercial website: [gratnellslearnometer.com/](http://www.gratnellslearnometer.com/)
* Monk Makes website: [monkmakes.com/](https://monkmakes.com/)
* Article: [Heat wave: Air conditioned schools would narrow the racial achievement gap](https://www.usatoday.com/story/opinion/2019/08/15/heat-wave-students-need-air-conditioning-close-achievement-gap-column/1996394001/)
* Video: [Investigating environmental data with micro:bits - Sensor board issue](https://youtu.be/mqbrFcdi0Es)
* Video: [Investigating environmental data with micro:bits - Load makecode extension for microbit](https://youtu.be/sx6OIfdg3sE)
* Video: [Investigating environmental data with micro:bits - Temperature calculation](https://youtu.be/nq1uu2490bk)
* Video: [Investigating environmental data with micro:bits - Creating functions and intrinsic documentation](https://youtu.be/LGaTYz022mk)
* Video: [Investigating environmental data with micro:bits - Sound and data, part 1](https://youtu.be/EidbZE5NK8Y)
* Video: [Investigating environmental data with micro:bits - Pairing micro:bit](https://youtu.be/r1VgzQV8to0)
* Video: [Investigating environmental data with micro:bits - Sound and data, part 2](https://www.youtube.com/watch?v=avL9GUGZpzg)
* Video: [gator setup](https://www.youtube.com/watch?v=wM1ITc6LRYs)
* Video: [gator sensors](https://youtu.be/bK1oecfEZ70)
* Article: [Revisiting speech interference in classrooms](https://pubmed.ncbi.nlm.nih.gov/11688542/)
* Article: [Classroom acoustic conditions: Understanding what is suitable through a review of national and international standards, recommendations, and live classroom measurements](https://www.researchgate.net/publication/310651345_Classroom_acoustic_conditions_Understanding_what_is_suitable_through_a_review_of_national_and_international_standards_recommendations_and_live_classroom_measurements)
* Article: [Exclusive: Elevated CO2 Levels Directly Affect Human Cognition, New Harvard Study Shows](https://thinkprogress.org/exclusive-elevated-co2-levels-directly-affect-human-cognition-new-harvard-study-shows-2748e7378941/)
* Article: [Air pollution causes ‘huge’ reduction in intelligence, study reveals](https://www.theguardian.com/environment/2018/aug/27/air-pollution-causes-huge-reduction-in-intelligence-study-reveals)
* Tutorial: [Sound is a pressure wave](https://www.physicsclassroom.com/class/sound/u11l1c.cfm#:~:text=The%20representation%20of%20sound%20by,of%20the%20pressure%2Dtime%20fluctuations.&text=Sound%20waves%20traveling%20through%20air,waves%20with%20compressions%20and%20rarefactions.)

Glossary

**general-purpose programming languages**Programming languages in common use designed to solve a wide range of problems. They include procedural, functional and object-oriented programming languages, including scripting and dynamically typed languages. Examples include C#, C++, Java, JavaScript, Python, Ruby and Visual Basic.

**lux**A measure of the illumination or amount of light produced by something. For example, we can use a light meter/lux meter to measure the light produced by a light bulb.

**pseudocode**A way of showing [algorithms](http://encyclopedia.kids.net.au/page/al/Algorithm) without use of any specific programming language. This makes the algorithm easy to understand for everyone whatever programming language they might use. Pseudocode may be written in English text with some common operation words used, for example if and else.

**variables**Created by programmers to hold the value of data that may change. For example, a variable may be created to hold the player’s score in a game.

**visual programming**A programming language or environment where a program is represented and manipulated graphically rather than as text. A common visual metaphor represents statements and control structures as graphic blocks that can be composed to form programs, allowing programming without having to deal with textual syntax. Examples include Alice, GameMaker, Kodu, Lego Mindstorms, MIT App Inventor, Scratch (Build Your Own Blocks and Snap).

See also [www.australiancurriculum.edu.au/f-10-curriculum/technologies/glossary/](http://www.australiancurriculum.edu.au/f-10-curriculum/technologies/glossary/)

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## **Appendix 3**

## **Digital systems task planning template**

This template is a suggested step-by-step approach that teachers might use to consider whether *all* or *any* of these links apply to an assessment task they develop themselves to better reflect the learning needs of their students and the context of their classroom and school.

Planning template suggested approach

Below is a broad outline of how to use the assessment task planning template on the following pages. It reflects the work of Wiggins and McTighe (2012) on Understanding by Design which features a backward design approach.

1. Begin with Digital Technologies:
	1. determine the aspects of the achievement standard that will be the focus of the task
	2. highlight the relevant aspects of the standard
	3. identify what knowledge and skills students will need in order to demonstrate the achievement standards (content descriptions)
	4. identify the strands and threads that will need to be addressed.
2. As Digital Technologies is the driving learning area, it is suggested that only the key ideas for this learning area be identified.
3. Indicate the key concepts of Digital Technologies that will be addressed and how.
4. Scan the Australian Curriculum to find meaningful connections between:
	1. learning areas (2 learning areas helps keep learning focused; avoid more than 3)
	2. general capabilities
	3. cross-curriculum priorities.

For example, connections could be established on the grounds of:

1. common concepts/key ideas, such as data/design/ways of thinking
2. common words, such as ‘create’, ‘communicate’ and ‘control’
3. contexts, from learning areas such as Science, HASS, HPE, The Arts.
4. Indicate what general capabilities and cross-curriculum priorities can be meaningfully addressed in the assessment task.
5. Construct a task that allows for discrimination in performance and includes:
	* title
	* band level
	* duration
	* task summary, including prior learning
	* achievement standards and content descriptions
	* task
	* assessment rubric.

Search for xxxx and replace with your own text.

**Title: xxxx**

**Assessment focus:** Australian Curriculum: Digital Technologies
(Digital systems). This task is also linked to xxxx. Depending on modifications made, opportunities may exist to link this task to xxxx.

**Band:** Years 7 and 8 (intended cohort Year X)

**Context:** xxxx

**Duration:** Dependent on how the task is to be implemented

**Prior learning:** Students will have:

* xxxx

Task summary

**Key inquiry question:**

* xxxx

**Focus questions:**

* xxxx

**Students will:**

* xxxx

Task features

Students will be asked to complete the following:

* xxxx

Digital Technologies

Achievement standard

By the end of Year 8, students distinguish between different types of networks and defined purposes. They explain how text, image and audio data can be represented, secured and presented in digital systems.

Students plan and manage digital projects to create interactive information. They define and decompose problems in terms of functional requirements and constraints. Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. They analyse and evaluate data from a range of sources to model and create solutions. They use appropriate protocols when communicating and collaborating online.

Content descriptions

|  |
| --- |
|  |

## Content strands[X any that apply]

|  |  |
| --- | --- |
| **Digital Technologies knowledge and understanding** | **Digital Technologies processes and production skills** |
| Digital systemsRepresentation of data | X | Collecting, managing and analysing dataCreating digital solutions by:investigating and defininggenerating and designingproducing and implementingevaluatingcollaborating and managing |  |

## Links to the key ideas[X any that apply]

## Read more about the [key ideas in the Australian Curriculum: Technologies](https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/key-ideas/).

|  |  |  |
| --- | --- | --- |
| **Creating preferred futures** | Students develop solutions to meet needs considering impacts on liveability, economic prosperity and environmental sustainability. |  |
| **Project management** | Students will develop skills to manage projects to successful completion through planning, organising and monitoring timelines, activities and the use of resources. |   |
| **Thinking in Technologies*** Systems thinking
 | Systems thinking is a holistic approach to the identification and solving of problems where the focal points are treated as components of a system, and their interactions and interrelationships are analysed individually to see how they influence the functioning of the entire system. |  |
| * Design thinking
 | Design thinking involves the use of strategies for understanding design needs and opportunities, visualising and generating creative and innovative ideas, planning, and analysing and evaluating those ideas that best meet the criteria for success. |  |
| * Computational thinking
 | Computational thinking is a problem-solving method that is applied to create solutions that can be implemented using digital technologies. It involves integrating strategies, such as organising data logically, breaking down problems into parts, interpreting patterns and models and designing and implementing algorithms. |  |

Links to the key concepts

The [key concepts](https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies/structure/)that underpin the Digital Technologies curriculum establish a way of thinking
about problems, opportunities and information systems and provide a framework for knowledge
and practice. (Colour coding is based on the [Australian Computing Academy scheme](https://aca.edu.au/#what-is-the-digital-technologies-curriculum).)

|  |  |  |
| --- | --- | --- |
|  | **abstraction** | underpins all content, particularly the content descriptions relating to the concepts of data representation; and specification; algorithms; and implementation  |
|  | **data collection**  | (properties, sources and collection of data) |  |
|  | **data representation**  | (symbolism and separation) |  |
|  | **data interpretation** | (patterns and contexts)  |  |
|  | **specification** | (descriptions and techniques) |  |
|  | **algorithms** | (following and describing) |  |
|  | **implementation** | (translating and programming) |  |
|  | **digital systems**  | (hardware, software, and networks and the internet) |  |
|  | **interactions** | (people and digital systems, data and processes) |  |
|  | **impacts** | (sustainability and empowerment) |  |

Cross-curriculum priorities[X any that apply] [Read more…](https://www.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/)

|  |  |  |
| --- | --- | --- |
| **Aboriginal and Torres Strait Islander histories and cultures** | **Asia and Australia’s engagement with Asia** | **Sustainability** |
|  |  |   |

## General capabilities[X any that apply] [Read more…](https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Literacy** | **Numeracy** | **ICT Capability** | **Critical and Creative Thinking** | **Ethical Understanding** | **Personal and Social capability** | **Intercultural Understanding** |
|   |   |  |  |   |  |  |

## Links to ICT Capability continuum: Level [ ] [X any that apply][Read more…](https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/information-and-communication-technology-ict-capability/)

Depending on the year level this activity is being used with, adjust content to the appropriate level.

Depending on the year level this activity is being used with, adjust content to the appropriate level;
for example, Level 4 or 6. [X any that apply]

|  |
| --- |
| **Apply social and ethical protocols and practices when using ICT**  |
| apply practices that comply with legal obligations regarding the ownership and use of digital products resources  |   |
| independently apply strategies for determining the appropriate type of digital information suited to the location of storage and adequate security for online environments  |   |
| identify and value the rights to identity, privacy and emotional safety for themselves and others when using ICT and apply generally accepted social protocols when using ICT to collaborate with local and global communities  |   |
| explain the benefits and risks of the use of ICT for particular people in work and home environments  |   |
| **Investigating with ICT**  |
| use a range of ICT to analyse information in terms of implicit patterns and structures as a basis to plan an information search or generation  |   |
| locate, retrieve or generate information using search facilities and organise information in meaningful ways  |   |
| assess the suitability of data or information using appropriate own criteria  |   |
| **Creating with ICT**  |
| use appropriate ICT to collaboratively generate ideas and develop plans  |   |
| design and modify simple digital solutions, or multimodal creative outputs or data transformations for particular audiences and purposes following recognised conventions  |   |
| **Communicating with ICT**  |
| select and use appropriate ICT tools safely to lead groups in sharing and exchanging information, and taking part in online projects or active collaborations with appropriate global audiences  |   |
| understand that there are various methods of collaboration through computer mediated communications that vary in form and control  |   |
| **Managing and operating ICT**  |
| independently select and operate a range of devices by adjusting relevant software functions to suit specific tasks, and independently use common troubleshooting procedures to solve routine malfunctions  |   |
| identify and compare networked ICT system components including between hardware, software and data  |   |
| manage and maintain data for groups of users using a variety of methods and systems  |   |

Links to Literacy and Numeracy

Depending on the year level this activity is being used with adjust content to appropriate level.

Links to Literacy

xxxx

Links to Numeracy

xxxx