# Digital Technologies – 5 and 6_ Digital systems and data

| | STRAND | | Knowledge and understanding | | | | Processes and production skills | | | | | | | | | | | | | |
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| | | | Digital systems | | Representation of data | | Collecting, managing and analysing data | | Creating Digital Solutions by: | | | | | | | | | | | |
| | | | | | | | | | Investigating and defining | | Generating and designing | | | | Producing and implementing | | Evaluating | | Collaborating and managing | |
| | **Content Description** | | Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014 ) | | Examine how whole numbers are used to represent all data in digital systems (ACTDIK015 ) | | Acquire, store and validate different types of data, and use a range of software to interpret and visualise data to create information (ACTDIP016) | | Define problems in terms of data and functional requirements drawing on previously solved problems (ACTDIP017 ) | | Design a user interface for a digital system (ACTDIP018) | | Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019) | | Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input (ACTDIP020) | | Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021) | | Plan, create and communicate ideas and information, including collaboratively online, applying agreed ethical, social and technical protocols (ACTDIP022 ) | |
| **Sequence of Lessons / Unit** | **Approx. time rq'd (hrs)** | **Year 5 or 6** | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # | CD | Achievement standard # |
| Connecting digital components | 7 | 6 | ☑ | 1 | ☐ | | ☐ | | ☑ | 3 | ☐ | | ☐ | | ☑ | 4 | ☐ | | ☐ | |

| **Years 3 and 4 Achievement Standard** | **Years 5 and 6 Achievement Standard**<br>Separated by line. Number in brackets, e.g. (3), can be used as an identifier in various parts of the template. | **Years 7 and 8 Achievement Standard** |
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| By the end of Year 4<br>• Students describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.<br>• They explain how the same data sets can be represented in different ways.<br>• Students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input.<br>• They explain how the solutions meet their purposes.<br>• They collect and manipulate different data when creating information and digital solutions.<br>• They safely use and manage information systems for identified needs using agreed protocols and describe how information systems are used. | By the end of Year 6:<br>• Students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. (1)<br>• They explain how digital systems use whole numbers as a basis for representing a variety of data types. (2)<br>• Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. (3)<br>• They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. (4)<br>• They explain how information systems and their solutions meet needs and consider sustainability. (5)<br>• Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols. (6) | By the end of Year 8<br>• Students distinguish between different types of networks and defined purposes.<br>• They explain how text, image and audio data can be represented, secured and presented in digital systems.<br>• Students plan and manage digital projects to create interactive information.<br>• They define and decompose problems in terms of functional requirements and constraints.<br>• Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. (<br>• They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability.<br>• They analyse and evaluate data from a range of sources to model and create solutions.<br>• They use appropriate protocols when communicating and collaborating online. |

**Connecting digital components**

Year Level 6 TOPIC Digital systems Time: 7 HOURS

Digital systems have internal and external components that perform different functions. For example, external components for inputting data include a keyboard, microphone and stylus. Internal processing components include the central processing unit. External output components include speakers, projector and screen. Data and information storage components include cloud and external devices. Devices can be connected via a network that enables data to be transmitted. Students can explore the use of wireless networks through controlling devices remotely via Bluetooth. This sequence culminates in students designing and creating a digital solution that incorporates data being transmitted via an input device or network.

| Flow of activities | | | | |
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| Short text | Input and output<br>Examine how a digital system works, showing inputs, how data is processed and the output. | Input devices<br>Explore a range of input devices developed over time and how they work. | Bluetooth enabled devices<br>Students control devices remotely via Bluetooth and a wireless network. | A digital solution<br>Design a digital solution in which data is input and output by digital systems. |
| Questions to guide exploration | *How is data input into a digital system, and how might it be output?* | *What do different input devices enable us to do?* | *How can you control devices remotely?* | *How can I apply what I know about digital systems?* |
| AC ALIGNMENT | *Digital systems (ACTDIK014 )* | *Digital systems (ACTDIK014 )* | *Digital systems (ACTDIK014 )* | *Digital systems (ACTDIK014)*<br>*Investigating and defining (ACTDIP017)*<br>*Producing and implementing (ACTDIP020)* |
| What's this about? | Input devices allow us to enter raw data into a computer. A digital system, such as a tablet or desktop computer, processes the data. It then produces outputs that are communicated using an output device. Input devices can be manual or automatic.<br><br>Data such as text, images, sound and numbers are input into a digital system using a range of digital devices. The output is communicated using different components; for example, a speaker for sound.<br><br>To enable data input, specific software may be required; for example, to gain audio and video input from a webcam the digital system requires suitable software. This software is also used to output the webcam data to a screen. | Users of digital systems need to have the ability to enter data into computers. Various peripheral devices have been created to fulfil this need and this process of invention continues. | Bluetooth low energy is an emerging low-power wireless technology developed for short-range control and monitoring applications. | As students design a digital solution, they can apply their understanding of the way in which data is input and output by digital systems. Students empathise with the target audience, going through a process of ideation and then design. Creating enables students to test whether their design works as expected. |
| The focus of the learning (in simple terms) | Review the way in which the internal and external components of digital systems are coordinated to handle data; for example, how a keyboard, central processing unit and monitor work together to accept, manipulate and present data and information. Provide opportunities to include sensors to cover automated data input.<br><br>Digital systems such as a computer can be programmed to respond to input devices such as sensors. For example, in a water heater sensors are used to react to a drop in temperature and to tell an output device, such as a heating element, to heat up the water.<br><br>Students create a visual representation such as a labelled diagram to show how a digital system of interest works, showing inputs, how data is processed and the output. They may include specific software that is required as part of the system.<br><br>Students share completed representations to help answer the question: 'How is data input into a digital system, and how might it be output?' | Explore a range of input devices developed over time and how they work. These could include paper tape, punch cards, keyboard, joystick, game controller, accelerometer, microphone and speech recognition, intelligent assistants, graphics tablet, scanner, stylus, touchscreen and webcam.<br><br>Each group prepares a short presentation. In particular, groups should identify the need(s) fulfilled by each of the devices. With a focus on different peripheral devices students present ten ways to input data into a digital computing device. Include a range of data types text, numeric, image and sound. The task could be set around creating a 'how to' guide for the particular usage.<br><br>Makey Makey is a simple circuit board that lets you turn any conductible surface into an input device for your computer. Students can explore and use different materials to test ways to provide an input. | Students control devices remotely via Bluetooth and a wireless network. Devices may include:<br>• electronic kits such as littleBits that include a Bluetooth component; these can be used with a smartphone or tablet to control electric motors, buzzers or LEDs (lights) that are connected in a circuit<br>• robotic devices such as Sphero, Lego EV3 or similar that are Bluetooth enabled<br>• BBC Micro:bit and app; the app allows you to send code to your Micro:bit wirelessly using Bluetooth.<br><br>Ask students to demonstrate how to control a device remotely and explain the role Bluetooth technology plays. Discuss the advantages and disadvantages of Bluetooth technology and some potential applications. This technology could also be contrasted with the devices that use cabled connections. Identify parts that are for different purposes; for example, USB charging and Bluetooth for control, as opposed to continuous cable connection for control. | Students design a digital solution that incorporates data being transmitted via an input device or network for a particular purpose or to meet a particular need.<br><br>Students plan their design and identify the data and functional requirements.<br><br>If time permits, students create a digital solution by implementing their design. |
| Supporting resources and tools and purpose/context for use | What are input and output devices?<br>View this resource to find out about the many different peripheral devices that enable us to input data; and to find out about devices that display the output.<br><br>Controlling physical systems<br>View this resource to find out about peripheral devices that perform automated tasks and how sensors are used in a digital system to perform tasks automatically.<br><br>Inside your computer: Bettina Bair<br>This video describes the parts of the computer and how they interact with one another so that the computer works in the way that it does. | Talk to me<br>The first part of this lesson provides guidance to investigate different input devices.<br><br>Makey Makey<br>Makey Makey provides lessons, video tutorials and how-to guides for the Makey Makey circuit board. | Micro:bit: Start coding with the JavaScript Blocks editor<br>This resource provides support to code the Micro:bit. This lesson could be done in conjunction with a unit on programming. The Micro:bit program can be downloaded via Bluetooth. Students can program two or more BBC Micro:bits to interact and transmit data.<br><br>littleBits<br>Explore the Bluetooth capabilities using an electronics kit such as littleBits.<br><br>Robots in the 2016 Australian classroom<br>This document provides details of relevant robotic devices that have Bluetooth capability. There are various robotic devices and drones that are controlled via Bluetooth and suitable for this year level; for example, Sphero, Dash and Dot, and mBot. | Makey Makey Orchestra<br>Students explore an orchestra and use Makey Makey to make a musical instrument for an ensemble.<br><br>Programming robots with Sphero<br>Design a maze for a robotic device to navigate. The robot is controlled via Bluetooth and programmed via an app.<br><br>Talk to me<br>The second part of this lesson provides guidance to support students to create their own input device for a smartphone while exploring virtual reality applications. |
| Assessment | **Suggested approaches**<br>• Presentation or demonstration<br>• Labelling diagram<br><br>**Achievement standard**<br>**Explain** the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. | **Suggested approaches**<br>• Presentation or demonstration<br><br>**Achievement standard**<br>**Explain** the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. | **Suggested approaches**<br>• Digital capture: Take a photo or video of the way the device is controlled via Bluetooth<br>**Achievement standard**<br>**Explain** the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. | **Suggested approaches**<br>• Artefact analysis<br>• Design plan, including algorithm development<br><br>**Achievement standard**<br>**Explain** the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. |