



Strand	Knowledge and understanding		Processes and production skills													
	Digital systems	Representation of data	Collecting, managing and analysing data		Creating digital solutions by:											
Content Description	Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007)	Recognise different types of data and explore how the same data can be represented in different ways (ACTDIK008)	Collect, access and present different types of data using simple software to create information and solve problems (ACTDIP009)	Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010)	Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011)	Explain how student solutions and existing information systems meet common personal, school or community needs (ACTDIP012)	Plan, create and communicate ideas and information independently and with others, applying agreed ethical and social protocols (ACTDIP013)	Investigating and defining	Producing and implementing	Evaluating	Collaborating and managing					
								CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD
Exploring input and output	7	4	<input checked="" type="checkbox"/>	1					<input checked="" type="checkbox"/>	3	<input checked="" type="checkbox"/>	3				

Years F-2 Achievement Standard	Years 3 and 4 Achievement Standard	Years 5 and 6 Achievement Standard
<p>By the end of Year 2</p> <ul style="list-style-type: none"> <li>Students identify how common digital systems (hardware and software) are used to meet specific purposes. (1)</li> <li>They use digital systems to represent simple patterns in data in different ways. (2)</li> <li>Students design solutions to simple problems using a sequence of steps and decisions. (3)</li> <li>They collect familiar data and display them to convey meaning. (4)</li> <li>They create and organise ideas and information using information systems, and share information in safe online environments. (5)</li> </ul>	<p>By the end of Year 4</p> <ul style="list-style-type: none"> <li>Students describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes. (1)</li> <li>They explain how the same data sets can be represented in different ways. (2)</li> <li>Students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input. (3)</li> <li>They explain how the solutions meet their purposes. (4)</li> <li>They collect and manipulate different data when creating information and digital solutions. (5)</li> <li>They safely use and manage information systems for identified needs using agreed protocols and describe how information systems are used. (6)</li> </ul>	<p>By the end of Year 6:</p> <ul style="list-style-type: none"> <li>Students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. (1)</li> <li>They explain how digital systems use whole numbers as a basis for representing a variety of data types. (2)</li> <li>Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. (3)</li> <li>They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. (4)</li> <li>They explain how information systems and their solutions meet needs and consider sustainability. (5)</li> <li>Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols. (6)</li> </ul>

Topic: Digital systems

Units

Year 3

Year 4

<p><b>Peripheral devices</b> 5 hours</p> <p>Explore, sort and classify peripheral devices. Use peripheral devices for a particular task.</p>	<p><b>Exploring input and output</b> 7 hours</p> <p>Explore inputs and outputs using a circuit board, electronic kit or programmable board.</p>
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**Exploring inputs and outputs**

Digital systems store, process and transmit information in digital form. A computer, notebook, tablet and smartphone are all examples of digital systems. Connecting other digital components (peripherals) to a digital system enables different functions; for example, a simple circuit board can be used as an input device, replacing keystrokes on a keyboard. This opens up the possibility of using a range of materials for input, allowing creativity in design.

A programming board enables the use of different inputs; for example, a push button to initiate an action; or a sensor to gather data such as temperature or light levels. Similarly, a snap-together circuit can have components such as a power supply, motor (servos), sensors, lights, buzzers, switches, and Bluetooth connectivity – enabling remote control. The device can often be programmed using a visual programming language, which allows students to integrate understandings of inputs and outputs of digital systems with programming a digital solution.

The circuit board, programming board and snap-together circuits suggested in this sequence are examples generally used by schools. It is envisaged that rather than incorporate all three devices or invention kits that schools focus on one and explore its functionality and then incorporate student design and implementation of a digital solution. There is no requirement to explore all three; rather, the intention is to cater for what resources schools may have or decide to purchase.

Flow of activities				
Questions to guide exploration	<i>What alternative input devices can I use?</i>	<i>How can I connect components in a circuit to my digital system?</i>	<i>Why connect a programming board to my digital system?</i>	<i>Can I design and control a digital solution using my digital system?</i>
Short text	<b>Input devices</b> Introduce the Makey Makey circuit board to explore alternative input devices.	<b>Connecting a circuit</b> Explore inputs and outputs using snap-together components connected in a circuit.	<b>Exploring a programmable board</b> Explore inputs and outputs using a programmable board such as BBC Micro:bits or Codebug.	<b>Digital system project</b> Create a digital solution that incorporates user input.
Australian Curriculum alignment	Digital systems (ACTDIK007)	Digital systems (ACTDIK007)	Digital systems (ACTDIK007)	Digital systems (ACTDIK007) Investigating and defining (ACTDIP010) Producing and implementing (ACTDIP011)
What’s this about?	<p>Makey Makey is an invention kit available for purchase that allows you to interact with a computer, using everyday objects as a replacement for inputs such as a keyboard or computer mouse.</p> <p>The Makey Makey board will plug directly into the computer’s USB peripheral port and essentially behave like an input device. When specific keys are pressed the Makey Makey board can mimic those keystrokes.</p> <p>Activating a key means creating a closed circuit. For the circuit to work, electrons have to be able to flow from the Makey Makey input key</p>	<p>Electronic kits that use snap-together components such as LittleBits enable students to explore simple circuitry that can be incorporated into a digital system.</p> <p>The LittleBits kit, for example, has a number of inputs such as buttons, dimmers and sensors. These send signals to the circuit. The kit also has outputs such as a buzzer, motor and light. The Bluetooth bit enables students to remotely control elements such as sliders. Other similar kits may vary in components and capabilities.</p>	<p>A programming board, such as a Micro:bit or Codebug, can have different inputs. For example, a push button can initiate an action. Different sensors can gather data such as temperature or light levels; or can detect movement of the device using an accelerometer.</p> <p>The different actions or events can be programmed via easy-to-use software provided on the relevant website.</p>	<p>Makey Makey, together with a visual programming language such as Scratch, Snap or similar, is a useful combination of tools that can be used to create digital solutions, as well as teach the basics of circuitry, conductive materials and algorithms.</p> <p>The Makey Makey board will plug directly into the computer’s USB peripheral port and essentially behave like an input device.</p> <p>You can program Makey Makey in Scratch to respond in certain ways when specific keys are pressed; Makey Makey will then mimic those keystrokes.</p>

	to Makey Makey's ground. So materials chosen as the input must conduct some level of electrical energy; that includes such things as aluminium foil, a banana and even a circuit drawn in grey lead pencil.			The Micro:bit, Codebug or LittleBits electronics kit provide students with the opportunity to design a digital solution for their own project.
The focus of the learning (in simple terms)	<p>Revise input devices and in particular the relationship between input devices the computer and software and an output. List the different types of input devices including keyboard, mouse and joystick.</p> <p>Explore the range of Makey Makey projects available on the internet to get students excited about exploring input devices.</p> <p>Ask students to connect a simple circuit. Have them choose one item, for example a banana, as the input and make sure it works. This idea can then be extended; for example, joining up more bananas and connecting these to arrow inputs and the space bar on the keyboard to play an online piano.</p>	<p>Explore the snap-together components to create a simple circuit.</p> <p>Start off by setting simple challenges. Examples of challenges are connecting a circuit that:</p> <ul style="list-style-type: none"> <li>provides a light, sound or movement</li> <li>provides a light that pulses or that can be dimmed or made brighter</li> <li>provides movement that can be made faster or slower.</li> </ul> <p>More challenging tasks</p> <ul style="list-style-type: none"> <li>Create movement (servo) or light (LED) using the sound sensor (for example, clapping to activate a component).</li> </ul> <p>As a further challenge you could include Bluetooth control. The LittleBits Bluetooth Low Energy (BLE) bit enables students to control their inventions wirelessly, from a smartphone or tablet. To do this you need the LittleBits Invent app and the BLE bit to move motors on wireless vehicles, or trigger buzzers.</p>	<p>Use the Micro:bit emulator or the Codebug emulator to explore inputs and outputs.</p> <p>Coding examples include:</p> <ul style="list-style-type: none"> <li><b>INPUT</b> on 'button A pressed' select an output such as <b>MUSIC</b> play tone Middle C for 1 beat.</li> <li><b>INPUT</b> on 'shake' select an output such as <b>BASIC</b> Show LEDs.</li> </ul> <p>For more challenging tasks, investigate the light levels. Use a variable for light level.</p> <ul style="list-style-type: none"> <li><b>INPUT</b> on 'button A pressed' select an output such as <b>BASIC</b> Show LEDs. However, you need to first add a <b>VARIABLE</b> block 'set item to' and change item to Light level. Then replace Show number to Light level.</li> </ul> <p>You can follow the same logic to record temperature.</p> <ul style="list-style-type: none"> <li><b>INPUT</b> on 'button A pressed' select an output such as <b>BASIC</b> Show LEDs. However, you need to first add a <b>VARIABLE</b> block 'set item to' and change item to temperature. Then replace Show number to Temperature.</li> </ul> <p>The code can be downloaded to a physical Micro:bit if the school has purchased these devices.</p>	<p>Offer students an opportunity to explore the Makey Makey, Micro:bit, Codebug or LittleBits electronics kit.</p> <p>Tell students that they will be creating a digital solution for their own project.</p> <p>Give students some time to explore possible projects and to design their solution on paper before implementation.</p> <p>The following are examples of projects that students could undertake.</p> <p><b>Makey Makey</b></p> <ul style="list-style-type: none"> <li>Create a sound machine.</li> <li>Create a game controller.</li> </ul> <p><b>Micro:bit or Codebug</b></p> <ul style="list-style-type: none"> <li>Create a compass that helps you find north.</li> <li>Create dice to use in a board game.</li> </ul> <p><b>LittleBits or similar electronics kit</b></p> <ul style="list-style-type: none"> <li>Create an animal that moves in response to the sound of your voice.</li> <li>Create your own alarm for a treasure box.</li> <li>Control a light remotely.</li> </ul> <p>Ask students to present their project and explain the input and corresponding output.</p>
Supporting resources and tools and purpose/context for use	<p><b>Learn about</b></p> <p><a href="#">Makey Makey quick start guide</a></p> <p>Use this quick start guide to find out how to get started with Makey Makey, and what Makey Makey is all about.</p> <p><a href="#">Makey Makey piano</a></p> <p>Link your inputs to play this basic online piano.</p>	<p><a href="#">Introducing LittleBits</a></p> <p>This lesson provides support to introduce LittleBits using simple challenges.</p> <p><a href="#">Outputs and inputs</a></p> <p>Get an introduction to inputs and outputs of the LittleBits kit.</p> <p><a href="#">Get the Code Kit app</a></p> <p>Download the Code Kit app.</p>	<p><a href="#">Let's code the Micro:bit</a></p> <p>Use the emulator to code the Micro:bit and explore inputs and outputs.</p> <p><a href="#">Codebug create</a></p> <p>Use the emulator to code the Codebug and explore inputs and outputs.</p> <p><a href="#">Explore the many features of the Micro:bit</a></p>	<p><a href="#">Makey Makey: Sound machine project</a></p> <p>Integrate Scratch programming and learn how to make a sound machine inspired by an electronic drum kit.</p> <p><a href="#">Makey Makey: Paper circuit project</a></p>

	<p><a href="#">Makey Makey Labz</a> Browse student projects for inspiration.</p> <p><a href="#">Apps to use with Makey Makey</a> Use these apps to create projects.</p>	<p><a href="#">An intro into LittleBits coding</a> Learn more about LittleBits coding.</p> <p><a href="#">Bluetooth Low Energy (BLE)</a> This is the purchase page for a BLE.</p>	<p>Understand more about the features of the Micro:bit.</p> <p><a href="#">Light level</a> This page explains how to easily code the Micro:bit to use the LED as a light sensor and output the data as a light level from 1 to 255.</p> <p><a href="#">Temperature</a> This page explains how to easily code the Micro:bit to use the temperature sensor and to output the data as a number in Celsius.</p> <p><a href="#">Codebug: Activities</a> These activities provide step-by-step instructions on how to program your Codebug.</p>	<p>Integrate Scratch programming and learn how to make a circuit board that creates music.</p> <p><a href="#">Micro:bit projects</a> Browse student projects for inspiration.</p> <p><a href="#">Codebug: Activities</a> These activities provide step-by-step instructions on how to program your Codebug.</p> <p><a href="#">LittleBits lessons</a> These lessons offers ideas about how to use LittleBits.</p>
Assessment	<p><b>Suggested approaches:</b> Have students explain their Makey Makey system and the choice of material for input.</p> <p>OR</p> <p>Students annotate a drawing of their Makey Makey system.</p> <p><b>Achievement standard</b> <b>Describe</b> how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.</p>	<p><b>Suggested approaches:</b> Have students explain their system of snap-together components in a circuit and the choice of input and its corresponding output.</p> <p><b>Achievement standard</b> <b>Describe</b> how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.</p>	<p><b>Suggested approaches:</b> Have students explain their programming board system, the choice of input and the corresponding output.</p> <p><b>Achievement standard</b> <b>Describe</b> how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.</p>	<p><b>Suggested approaches:</b> Have students present their project and use a peer review to provide feedback.</p> <p><b>Achievement standard</b> <b>Describe</b> how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.</p>