



CLASSROOM IDEAS: YEARS 3–6

Makey Makey interactive poster

The Makey Makey can be used by students to create a simple touch-sensitive/interactive poster. Figure 1a shows an example that plays voice recordings about the human body when metal split pins (Figure 1b) are touched (video youtu.be/dweFHyKe8qk).

This activity allows students to: use the Makey Makey as a digital system, create a digital solution, investigate how circuits work/the properties of materials (conductivity); and evaluate the effectiveness of the interactive poster design (user interface) for a user.



Figure 1b: Metal split pins

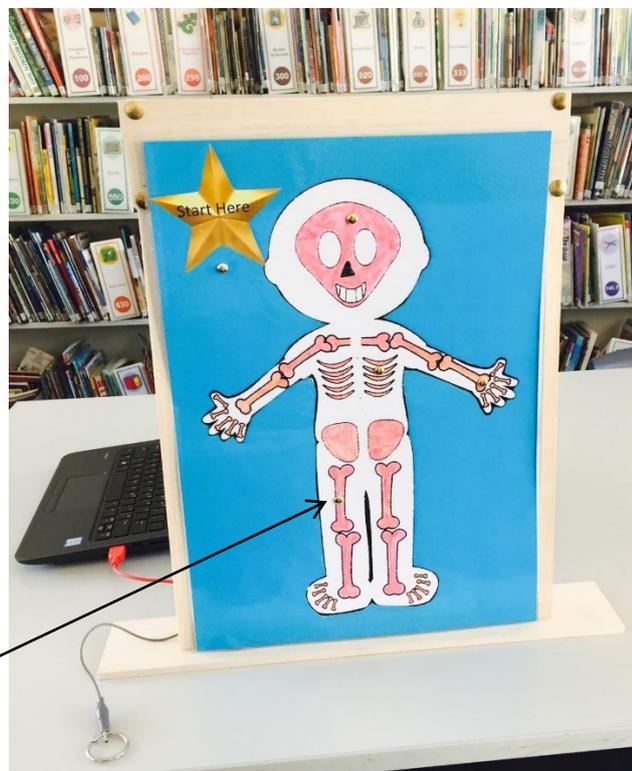


Figure 1a: An interactive poster made by students at Bellbrook Public School, New South Wales. The user interface uses metal split pins as 'buttons' and a metal ring as the earth.

About the Makey Makey

The Makey Makey is an electronic device. It allows users to connect conductive objects to a computer to create a variety of digital solutions. The Makey Makey kit components comprise a circuit board, alligator clips, tin-tipped wires and a mini USB to standard USB A cable. The Makey Makey uses a closed circuit to send electrical signals to a connected computer. A user can connect various conductive materials to the Makey Makey as inputs.

To understand how the Makey Makey works, your students might like to first complete an introductory tutorial (see Useful links).

The following resource is a tutorial guide for making an interactive poster. Of course, there are many other digital solutions your students could create using this idea as inspiration.

Making an interactive poster

Step 1: Setting up the Makey Makey as a digital system

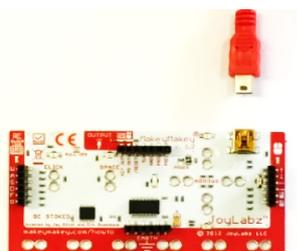


Figure 2: A Makey Makey circuit board and mini USB cable



Figure 3: A standard USB A plug. This connects the Makey Makey to a computer.

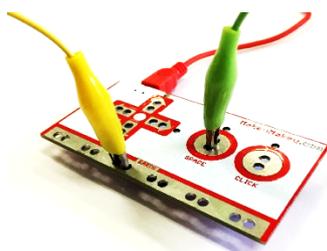


Figure 4



Figure 5

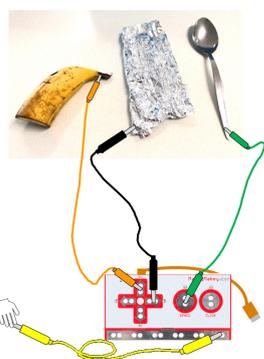


Figure 6

The Makey Makey becomes a digital system when components and a computer are connected. It can then be used as an input device for the computer.

Connect components in the following way:

1. Turn the board over (Figure 2). The small end of the USB cable (mini USB) fits into the gold socket on the back of the Makey Makey board.
2. The standard USB end of the cable (USB A) plugs into a standard USB computer port (Figure 3).
3. Use the teeth of an alligator clip to grab the Makey Makey board through the cut-out holes. You will notice each set of holes is labelled ('earth', 'space', 'click') or indicated with an arrow symbol: up, down, left and right. Figure 4 shows how to connect the space bar input. The teeth of the green alligator clip are attached through the holes labelled 'space'. The teeth of the yellow alligator clip are attached through two of the holes on the section of the board labelled 'earth'.

Note: The coloured alligator clips and wires (Figure 5) all do the same job; therefore, you can use any coloured alligator clip to make a connection. The colours are to help identify connections at both ends more easily.

4. Attach the other ends of the two alligator clips to something conductive, such as metal cutlery, aluminium foil or even fruit with a high water content (Figure 6). When the conductive material you have attached is touched at the same time as the earth connection this completes a circuit, which sends an input to your computer. The Makey Makey will operate any webpage or interact with any software that responds to an input, such as Scratch. The input should match connections you have made on the Makey Makey; for example, pressing the space bar, mouse click or pressing an arrow key.

Step 2: Making a poster with conductive materials

The poster will play a recording when a conductive area is touched by a user. Students will design the user interface of the poster to include conductive materials. Below are three ways you could do this: with a graphite art pencil, 6B or heavier (Figure 7); or aluminium foil (Figures 8 and 9). Wire, copper tape or metal split pins (pushed through the poster from the front to the back) also work well.

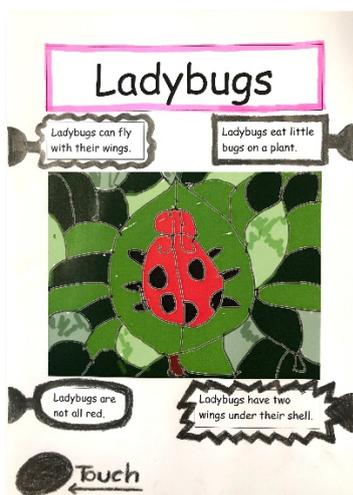


Figure 7

A thick line of conductive graphite art pencil has been used to create a closed shape around each area of text. Alligator clips must clip onto this.

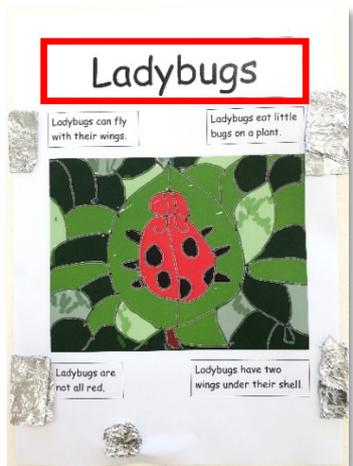


Figure 8

Aluminium foil has been bent around the poster from front to back. Alligator clips are then attached to the foil at the side or on the back of the poster.



Figure 9

Holes are cut in the poster and foil stuck behind each hole. Alligator clips are attached to the foil at the back of the poster.

Step 3: Making the poster interactive – creating code in Scratch

Now create the code (visual programming) that will make the poster interactive. This code will activate any input (user touch) coming from the Makey Makey.

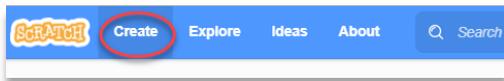


Figure 10

1. Open Scratch online <https://scratch.mit.edu/> or download the offline Scratch editor if you want to work on a project without being connected to the internet <https://scratch.mit.edu/download>.
2. Choose Create (Figure 10) from the menu bar at the top of the screen.



Figure 11

3. Add a sprite. You need to do this because any code you write must belong to a sprite. Since this is for an interactive poster, the sprite doesn't matter. The sprite could be:
 - the cat that is already there for a new project
 - a picture of the poster
 - a title page sprite that you draw yourself or make with text (Figure 11).

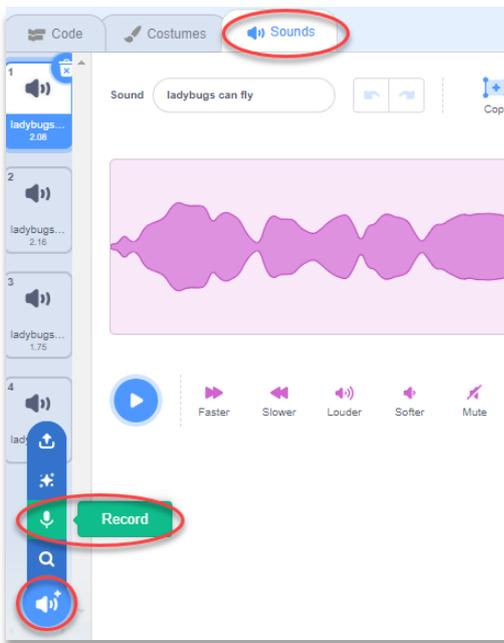


Figure 12

4. Record each voice narration for the poster (Figure 12).
 - a. Click the sounds tab.
 - b. Click the 'Choose a Sound' button in the left corner of the screen.
 - c. Choose the microphone icon.
 - d. Record your sound.
 - e. Save your sound.

Tip: Naming your sound is optional but it helps you to tell which recording is which later.

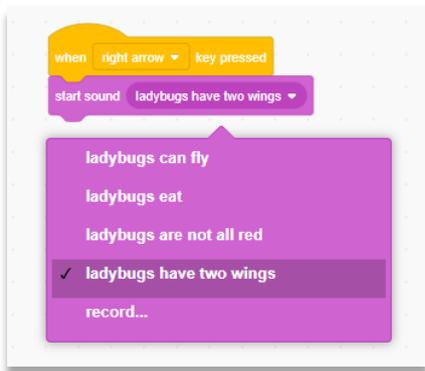


Figure 13

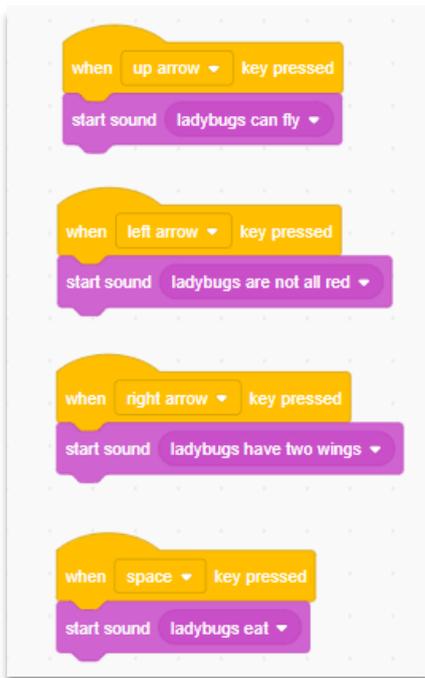


Figure 14

5. Write the code that will activate each of the interactive/conductive areas on the poster. You will need:
 - a. **When _____ key is pressed** event block (Figure 13). Use the drop-down arrow to choose an input that matches the labelled connection on the Makey Makey. For example, 'when right arrow key is pressed'.
 - b. Start sound block. You will need to click the drop-down arrow and choose the name of your recorded sound.
6. You should make four separate code block pairs, one for each input connected to the poster and labelled on the Makey Makey.

In this example (Figure 14), the up arrow, left arrow, right arrow and space bar will all be used as inputs and will be connected to the Makey Makey.

7. Connect the poster to the Makey Makey (Step 5) and test if it works. (The example in this video youtu.be/dweFHyKe8gk was made with split pins).

Troubleshooting: Why isn't my poster working?

- **Connections:**
 - Do you have a closed circuit? When you touch a conductive area, are you also either holding the earth connection in your hand or touching the earth area on the poster? See Figure 15.
 - Are the conductive areas of the poster connected to an input on the Makey Makey? Are the alligator clips securely fastened? Check they are not touching each other.
 - If you have used pencil as a conductive material, is it a thick line with no gaps? Have you used a graphite art pencil 6B or heavier? (A regular HB or 2B pencil is not conductive enough for this purpose.)
 - Is the USB cable plugged into your computer?
- **Hardware:**
 - Are speakers plugged into your computer and/or is volume turned up?
- **Software:**
 - Is Scratch open on your computer?
 - Do you have an event block and sound block for each connected Makey Makey input?

Step 4: Connecting the poster to the Makey Makey

The next step is to create a digital system using the poster, the Makey Makey and the computer. Figure 15 shows how to connect the interactive poster with a Makey Makey. This example is made with thick graphite pencil lines (at least 6B) as the conductive element. Notice each area in the example below is a closed loop. Students should check they have no gaps in their shape if this is their preferred design.

Some students like to hide the alligator clips by attaching them to the back of the poster so the user can't see them. This means that the conductive element will need to be visible on both the front (user interface) and back of the poster (to attach alligator clips).

Step 5: Testing/activating sound

To activate the sound recordings on the poster, touch the earth connection at the same time as touching another shape. See the yellow alligator clips in Figure 15.

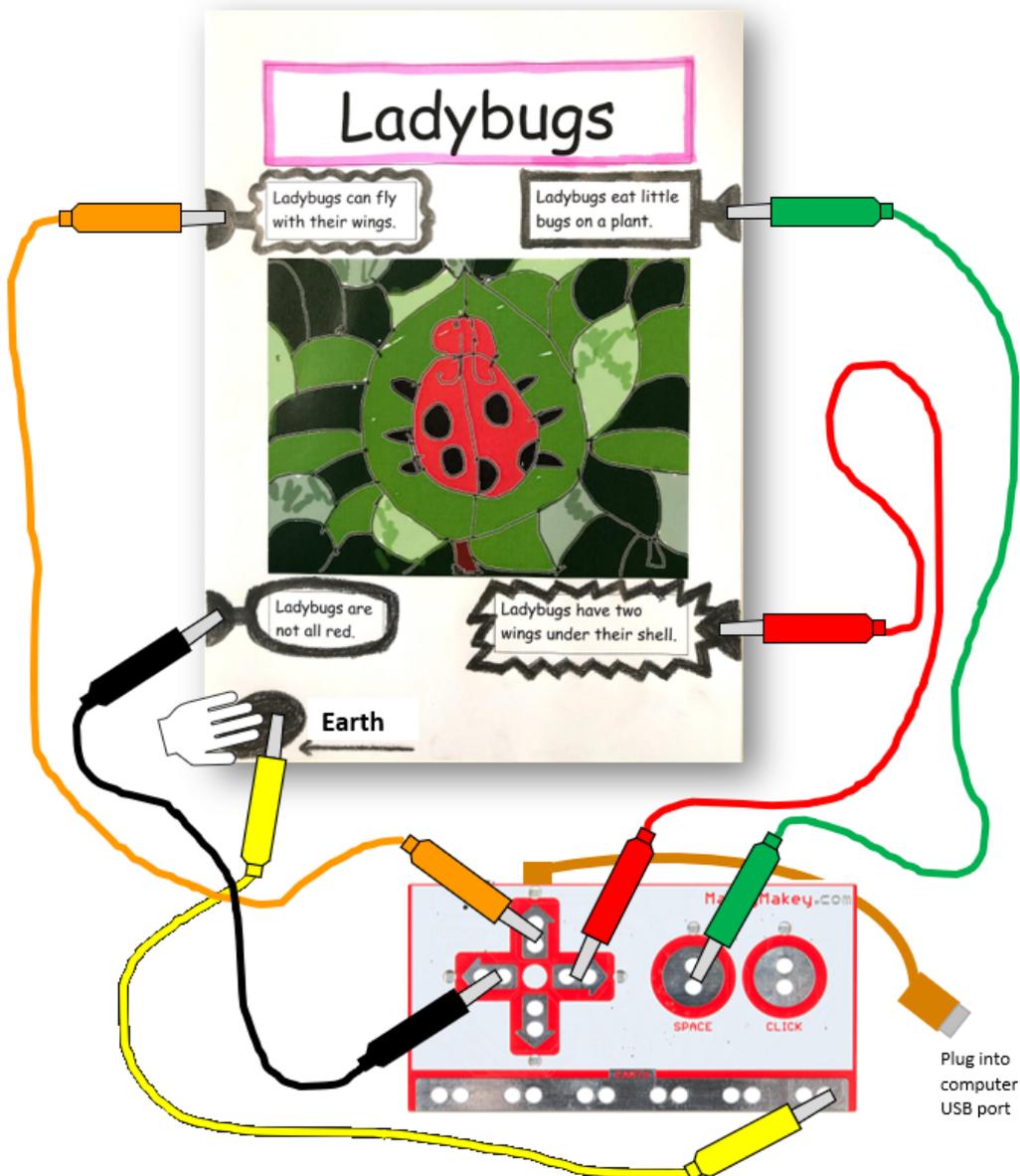


Figure 15

Extension activities

Some ideas to extend you students might include:

- Adjust the code (Figure 16) so that each time a button is pressed on the poster:
 - images change (switch backdrop)
 - text appears and sound is played
 - a question is asked on screen for the user to respond to.

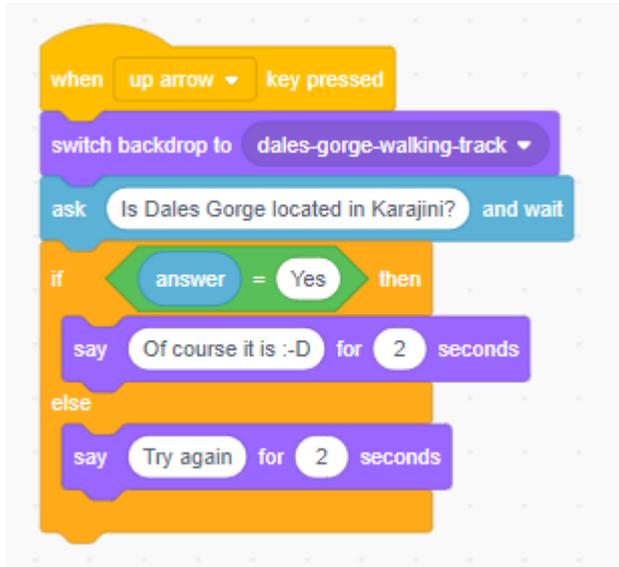


Figure 16: An example of interactive poster code for a single input (up arrow) created in Scratch. It has been designed to switch backdrop as well as to ask for and respond to user input.

- Design and produce a poster that incorporates other interactivity such as augmented reality. This will allow the user to interact with it both through touch as well as by viewing it with a mobile device.
- Design and produce other artefacts with interactivity and a focus on user interface design:
 - Three-dimensional shapes
 - Models or prototypes made of cardboard or other materials
 - Papier-mâché objects or creatures that speak or react in some way to user touch
 - Multimedia projects such as a narrative that incorporates sound effects, images or text to enhance the user experience.
- Design and produce an artefact that describes the Makey Makey as a peripheral device and how it becomes part of a digital system.

Links to the Australian Curriculum

Tables 1 and 2 provide teachers an opportunity to see related aspects of the Australian Curriculum version 9. which may be addressed depending upon the task. Tables 3 and 4 provide teachers an opportunity to see related aspects of the Australian Curriculum version 8.4. which may be addressed depending upon the task.

Table 1: Links to the Australian Curriculum: Digital Technologies Years 3–4 (V9)

<p>Digital Technologies</p> <p>Achievement standard</p>	<p>By the end of Year 4 students create simple digital solutions and use provided design criteria to check if solutions meet user needs. Students process and represent data for different purposes. They follow and describe simple algorithms involving branching and iteration and implement them as visual programs. Students securely access and use digital systems and their peripherals for a range of purposes, including transmitting data. They use the core features of common digital tools to plan, create, locate and share content, and to collaborate, following agreed behaviours. Students identify their personal data stored online and recognise the risks.</p>		
<p>Strand</p> <p>Sub-strand</p>	<p>Digital Technologies knowledge and understanding</p> <ul style="list-style-type: none"> • Digital systems • Data representation <p>Processes and production skills</p> <ul style="list-style-type: none"> • Investigating and defining • Generating and designing • Producing and implementing • Evaluating • Collaborating and managing 		
<p>Content descriptions</p>	<ul style="list-style-type: none"> • explore and describe a range of digital systems and their peripherals for a variety of purposes AC9TDI4K01 • recognise different types of data and explore how the same data can be represented differently depending on the purpose AC9TDI4K03 • define problems with given design criteria and by co-creating user stories AC9TDI4P01 • follow and describe algorithms involving sequencing, comparison operators (branching) and iteration AC9TDI4P02 • generate, communicate and compare designs AC9TDI4P03 • implement simple algorithms as visual programs involving control structures and input AC9TDI4P04 • discuss how existing and student solutions satisfy the design criteria and user stories AC9TDI4P05 • use the core features of common digital tools to create, locate and communicate content, following agreed conventions AC9TDI4P06 		
<p>Technologies Core concepts</p>	<ul style="list-style-type: none"> • Systems • Data • Interactions and impact • Systems thinking 	<p>Digital Technologies Core concepts</p>	<ul style="list-style-type: none"> • Digital systems • Data representation • Abstraction • Specification • Algorithms • Implementation

	<ul style="list-style-type: none"> • Computational thinking • Design thinking • Technologies process and production skills • Project management skills • Enterprise skills and innovation 	General capabilities	<ul style="list-style-type: none"> • Digital Literacy • Literacy • Numeracy
Cross-curriculum priorities		Learning area or subject connections	<ul style="list-style-type: none"> • Science

Table 2: Links to the Australian Curriculum: Digital Technologies 5–6 (V9)

Digital Technologies Achievement standard	By the end of Year 6 students develop and modify digital solutions, and define problems and evaluate solutions using user stories and design criteria. They process data and show how digital systems represent data. Students design algorithms involving complex branching and iteration and implement them as visual programs including variables. They securely access and use multiple digital systems and describe their components and how they interact to process and transmit data. Students select and use appropriate digital tools effectively to plan, create, locate and share content, and to collaborate, applying agreed conventions and behaviours. They identify their digital footprint and recognise its permanence.
Strand Sub-strand	<p>Digital Technologies knowledge and understanding</p> <ul style="list-style-type: none"> • Digital systems • Data representation <p>Digital Technologies processes and production skills</p> <ul style="list-style-type: none"> • Investigating and defining • Generating and designing • Producing and implementing • Evaluating • Collaborating and managing
Content descriptions	<ul style="list-style-type: none"> • investigate the main internal components of common digital systems and their function AC9TDI6K01 • explain how digital systems represent all data using numbers AC9TDI6K03 • define problems with given or co-developed design criteria and by creating user stories AC9TDI6P01 • design algorithms involving multiple alternatives (branching) and iteration AC9TDI6P02 • design a user interface for a digital system AC9TDI6P03 • generate, modify, communicate and evaluate designs AC9TDI6P04 • implement algorithms as visual programs involving control structures, variables and input AC9TDI6P05 • evaluate existing and student solutions against the design criteria and user stories and their broader community impact AC9TDI6P06

	<ul style="list-style-type: none"> select and use appropriate digital tools effectively to create, locate and communicate content, applying common conventions AC9TDI6P07 		
Technologies Core concepts	<ul style="list-style-type: none"> Systems Systems thinking Computational thinking Data Technologies processes and production skills Interactions and impact Project management skills Enterprise skills and innovation 	Digital Technologies Core concepts	<ul style="list-style-type: none"> Digital systems Data representation Abstraction Specification Algorithms Implementation
		General capabilities	<ul style="list-style-type: none"> Digital Literacy Literacy Numeracy
Cross-curriculum priorities		Learning area or subject connections	<ul style="list-style-type: none"> Science

Table 3: Links to the Australian Curriculum: Digital Technologies 3–4 (V8.4)

Digital Technologies Achievement standard	<p>By the end of Year 4, students describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes. They explain how the same data sets can be represented in different ways.</p> <p>Students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input. They explain how the solutions meet their purposes. They collect and manipulate different data when creating information and digital solutions. They safely use and manage information systems for identified needs using agreed protocols and describe how information systems are used.</p>
Strands	<p>Digital Technologies knowledge and understanding</p> <ul style="list-style-type: none"> Digital systems <p>Digital Technologies processes and production skills</p> <ul style="list-style-type: none"> Creating designed solutions by <ul style="list-style-type: none"> Investigating and defining Producing and implementing Generating and designing Evaluating
Content descriptions <i>Aspects of the following are addressed:</i>	<ul style="list-style-type: none"> Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007) 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)

Key concepts	<ul style="list-style-type: none"> • specification • algorithms • implementation • digital systems 	Key ideas	Thinking in Technologies <ul style="list-style-type: none"> • computational thinking • systems thinking • design thinking
Cross-curriculum priorities		General capabilities	<ul style="list-style-type: none"> • Information and Communication Technology (ICT) Capability • Literacy • Numeracy

Table 4: Links to the Australian Curriculum: Digital Technologies 5–6 (V8.4)

Digital Technologies Achievement standard	<p>By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. They explain how digital systems use whole numbers as a basis for representing a variety of data types.</p> <p>Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.</p>		
Strands	Digital Technologies knowledge and understanding <ul style="list-style-type: none"> • Digital systems Digital Technologies processes and production skills <ul style="list-style-type: none"> • Creating designed solutions by <ul style="list-style-type: none"> – Investigating and defining – Producing and implementing – Generating and designing – Evaluating 		
Content descriptions <i>Aspects of the following are addressed:</i>	<ul style="list-style-type: none"> • Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014) • Define problems in terms of data and functional requirements drawing on previously solved problems (ACTDIP017) • Design a user interface for a digital system (ACTDIP018) • 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) 		
Key concepts	<ul style="list-style-type: none"> • abstraction • specification • algorithms • implementation • digital systems • interactions 	Key ideas	Thinking in Technologies <ul style="list-style-type: none"> • computational thinking • systems thinking • design thinking

Cross-curriculum priorities

General capabilities

- Information and Communication Technology (ICT) Capability
- Literacy
- Numeracy

Acknowledgement

This resource was inspired by the University of Adelaide CSER Digital Technologies education Makey Makey project exemplar: <https://csermoocs.adelaide.edu.au/lending-library/#lesson-plan-and-project-exemplars>

Useful links

- A basic guide to using the Makey Makey <https://makeymakey.com/blogs/how-to-instructions/first-time-set-up-basic-how-to-guide>
- Scratch tutorials (Record a Sound) <https://scratch.mit.edu/projects/editor/?tutorial=all>
- Digital Technologies Hub: Makey Makey ideas <https://www.digitaltechnologieshub.edu.au/>

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