



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 <https://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

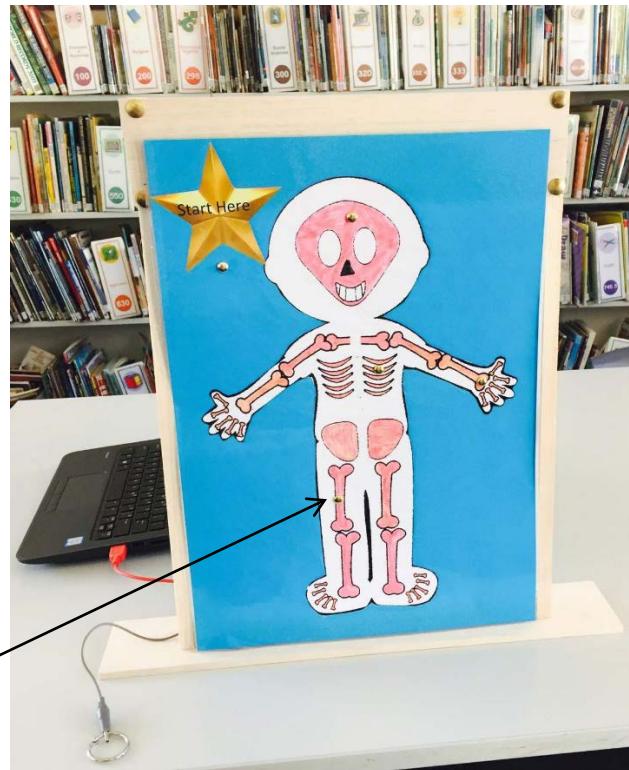


Figure 1a: An interactive poster made by students at Bellbrook Public School, New South Wales. The user interface uses metal split pins as 'buttons' and a metal ring as the earth.

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

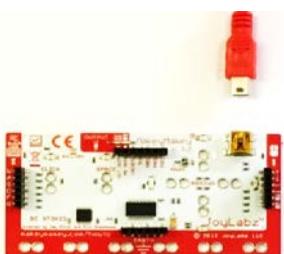


Figure 2: A Makey Makey circuit board and mini USB cable

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).



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

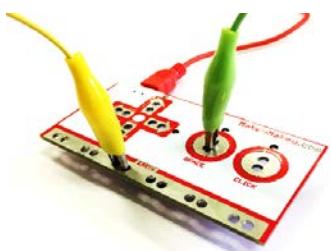


Figure 4

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.



Figure 5

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.



Figure 6

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.

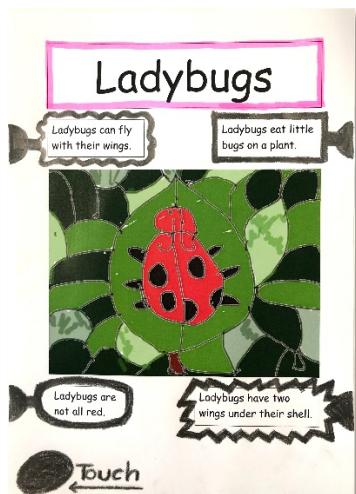


Figure 7

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.

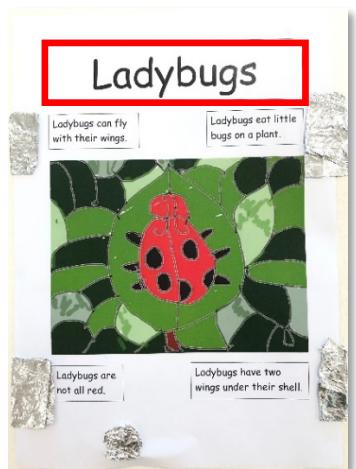


Figure 8

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.

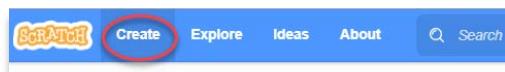


Figure 10

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.
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 11

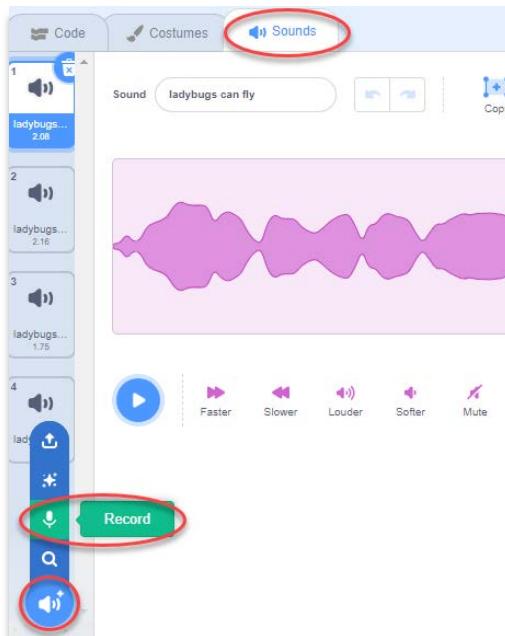


Figure 12

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.

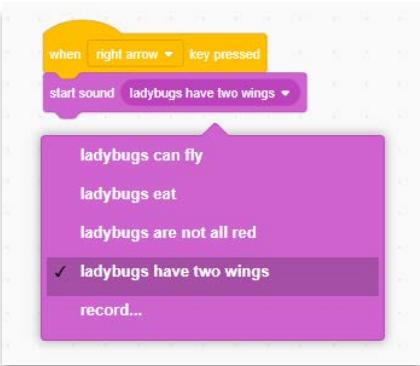


Figure 13

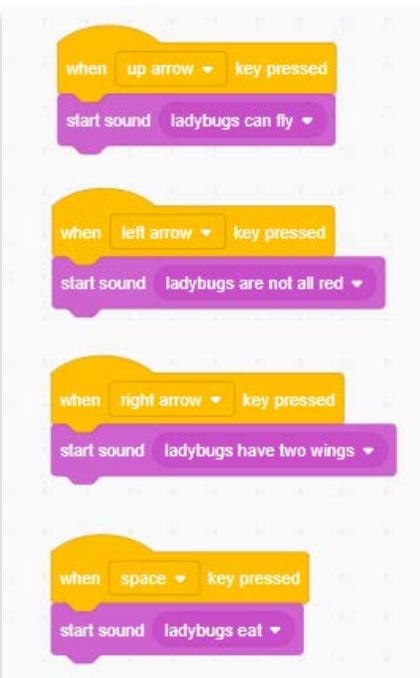


Figure 14

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 <https://youtu.be/dweFHyKe8qk> 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.

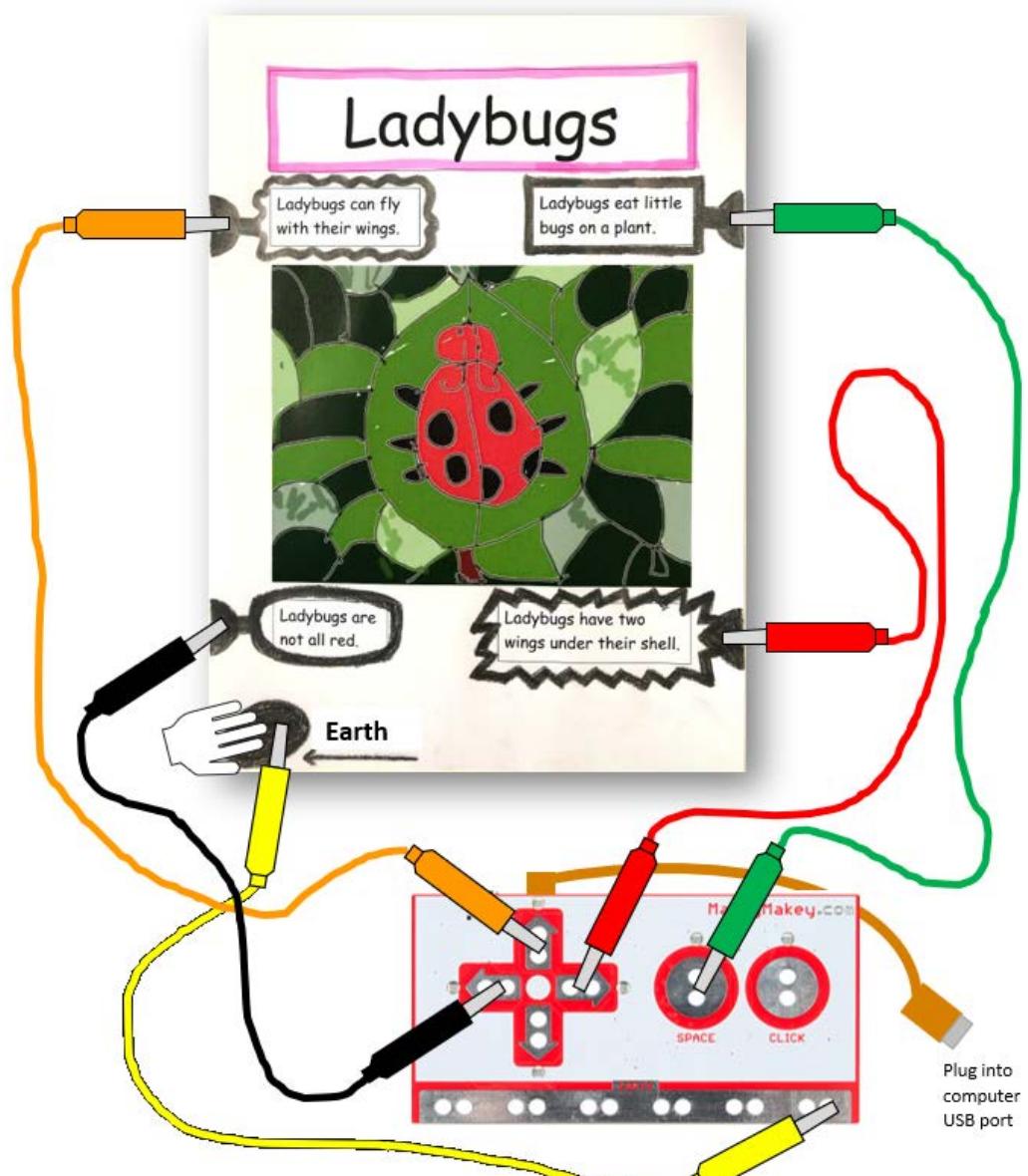


Figure 15

Extension activities

Some ideas to extend your 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, which may be addressed depending upon the task.

Table 1: Links to the Australian Curriculum: Digital Technologies 3–4

Digital Technologies Achievement standard	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. 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.		
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">• 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

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/>

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

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	<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 Aspects of the following are addressed:	<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	<p>Thinking in Technologies</p> <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

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