

Exploring Digital Systems with Makey Makey

Year level band: F-2 (can be adapted and extended for Years 3-6)

Description: In this activity, students learn about digital systems and how a circuit works using the Makey Makey toolkit. They sort conductive and nonconductive items into groups using an experimental approach.

Resources:

- Computers,
- Makey Makey kits
- Conductive and nonconductive materials (e.g. paper, foil, foam, cardboard, fruit)
- Pencils (for recording)
- Camera to record experiment (optional)

Prior Student Learning: Students may have done some prior work that involves identifying input and output devices, for example that a mouse and keyboard are input devices and that a screen or speakers are output devices, but this is not necessary.

Australian Curriculum Summary	
Students learn about digital systems, and components that make up a system, using the Makey Makey technology.	
This lesson can connect with Science learning, and in the early years, particularly with regard to making predictions, recording, responding and reflecting in scientific ways, and how circuits work.	
In the early years, this lesson has a gentle introduction to digital systems, and how components interact. However, this lesson could be adapted for Years 3-6, to incorporate circuits and involve students developing their own Scratch program to use with the Makey Makey.	
Year	Content Descriptors
F-2	Digital Technologies <ul style="list-style-type: none"> • Recognise and explore digital systems (hardware and software components) for a purpose (ACTDIK001)
	Capabilities <ul style="list-style-type: none"> • ICT • Critical and Creative Thinking

Element	Summary of tasks
Learning hook	Before the lesson, the teacher sets up the Makey Makey (with Playdough connected, or something conductive, such as fruit, as well as a section of two



	<p>conductive and nonconductive materials). The Makey Makey is connected to one of the musical apps listed on the Makey Makey site: http://makeymakey.com/apps/</p> <p>If it is possible, the teacher projects the Makey Makey Scratch program on a screen or Interactive Whiteboard, otherwise, having the computer with Makey Makey in a visible location, such as the front of the room will be fine.</p> <p>The teacher asks students to sit in a circle on the floor. The teacher asks the students to describe what they see. (Identifying: Computer, cables, objects, Makey Makey keypad, Scratch program on the screen, etc.)</p> <p>The teacher invites students to come up and try touching and experiencing the Makey Makey, making sounds with a selection of a few conductive materials.</p> <p>The teacher asks questions:</p> <ul style="list-style-type: none"> ● What do you notice? ● What is happening? What do they see and hear? ● How do you think it is working? ● What happens on the screen when we push the controller? <p>The goal is to have students realise that the software, the hardware and the peripheral device (Makey Makey keyboard) are all connected, and that the circuit must be complete for it to work.</p> <p>Teachers can ask students how many of them have used a controller before and what types of controllers they have used for what purposes (e.g. playing games, television), relating this back to the Makey keypad and the program on the screen.</p>
<p>Achievement Standards</p> <p>Learning Map (Sequence)</p>	<p><u>Digital Technologies</u></p> <p>Foundation - 2: By the end of Year 2, students identify how common digital systems (hardware and software) are used to meet specific purposes.</p> <p><u>Science</u></p> <p>Foundation: Students share and reflect on observations, and ask and respond to questions about familiar objects and events.</p> <p>Year 1: Students respond to questions, make predictions, and participate in guided investigations of everyday phenomena. They follow instructions to record and sort their observations and share them with others.</p> <p>Year 2: Students pose and respond to questions about their experiences and predict outcomes of investigations. They use informal measurements to make and compare observations. They record and represent observations and communicate ideas in a variety of ways.</p> <p>In this lesson, students:</p> <ul style="list-style-type: none"> ● understand that how a circuit is made complete. ● identify all the components of a complete a digital system: the computer, controller, power, user. ● investigate whether materials are electrically conductive ● come to describe that some objects with some metal or moisture (water) in them work with the Makey Makey (as conductors).
<p>Learning input</p>	<p>The teacher now introduces non-conductive materials to the centre of the classroom.</p> <p>They continue to experiment with using the Makey Makey system, asking:</p> <ul style="list-style-type: none"> ● What do you notice? ● Why do some objects work, and others do not?



	<p>Modelling their responses, the teacher sorts the objects into “conductive” and “nonconductive”, as the class identify if they work or not.</p>
Learning construction	<p>Students now work on doing their own sorting activity in pairs or small groups.</p> <p>The teacher can have the Makey Makeys already pre-prepared on computers for the students to use, or work with them to connect their Makey Makey, step-by-step (depending on age).</p> <p>Students can either select 6 objects from the middle of the class that have been curated by the teacher, or find their own objects to test with the Makey Makey from their schoolyard or classroom.</p> <p>Students work together to test and sort their objects into two groups: “conductive” and “nonconductive”/ “yes” and “no”.</p> <p>Recording: Students take a photo of their final sorted objects.</p> <p>Students are to draw their digital system (Makey Makey) and label parts of the system (either by writing, or gluing labels provided by the teacher, depending on literacy level).</p> <p>Students work together to write down (or with teacher support) what they notice (observe) about their experiment - either how the system worked or the use of the objects.</p> <p>Note: Marc Faulder noticed that the class also sorted objects into a third pile, depending on where you put the clip.</p>
Learning demo	<p>The groups come back to the centre of their class with their recordings and share what they found out about their objects.</p> <p>The teacher physically groups some of their collective observations into the centre of the room.</p> <p>The teacher invites them to share what they can notice about each group.</p>
Learning reflection	<p>Students reflect on their experiences in working scientifically with their peer or team.</p>
Learning Extension/ Future Lesson	<p>Students, based on what they have observed, select 2-3 objects and invent a musical instrument.</p> <p>Students draw their instrument.</p> <p>In this lesson, teachers are looking to see whether students have included all parts of the digital system in their design, and whether the objects they have selected are appropriate.</p>

Assessment:

In this activity, the teacher observes the way that students work scientifically in groups. The teacher could collect data about:

- Their sorted objects through photos.
- The questions and observations that students are making during the investigation by asking questions that elicit a response.



- Their final observations and representation of the Makey Makey system, as depicted in their drawing.

Criteria	Quantity of knowledge			Quality of understanding	
	Pre-structural	Uni-structural	Multi-structural	Relational	Extended abstract
Scientific Thinking	No observations	Observations related to the object name only.	Student has recorded observations about the properties of the objects: with evidence including description about the object and/or reasoning.	Observation of the experiment relates includes the relationship between objects and the digital system.	Students are able to identify properties of the objects in their observations that go beyond the scope of learning toward an understanding of conductive and nonconductive materials and the interactions within their system.
Digital Systems	Digital system incomplete.	Digital system components are missing.	Digital system components complete but show no connection between relationships.	Digital system is complete with labels.	Digital system is complete and shows evidence of understanding the interaction between the components in the digital system.
Vocabulary	When describing a digital system, no specific vocabulary is used.	A term, such as computer or 'Makey Makey' may be used.	The terms "system" is used and identification of some components in the system (controller).	The terms digital system and identification of elements in the system are confidently used, along with "input" and/or "output".	Specific vocabulary like peripheral devices or input and output devices is used, going beyond the set language.

Teacher/Student Instructions:

For information on how to set-up the Makey Makey, we recommend printing, or talking through this web resource:

<http://makeymakey.com/how-to/classic/#SETUP>

CSER Professional Learning:



This lesson plan corresponds to professional learning in the following CSER Digital Technologies MOOCs:

F-6 Digital Technologies: Foundations

- Unit 4: Digital Systems

See: <http://csermoocs.adelaide.edu.au/moocs>

Further Resources:

For further Makey Makey lesson plans and resources see: <http://makeymakey.com/how-to/>

Digital Technologies Hub: www.digitaltechnologieshub.edu.au

CSER: <https://csermoocs.adelaide.edu.au>



This lesson has been inspired by Marc Faulder of enabling-environments.co.uk: “Introducing Makey Makey to Your Early Years Children”.

Author: Rebecca Vivian

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