Introduction to littleBits with Makey Makey

Year level band: 7-8

Description:
This project introduces students to the littleBits kit and the Makey Makey bit and discusses how they can be used to build digital systems.

Type: Visual programming, systems thinking

Resources:
- littleBits Rule Your Room Kit
- littleBits Rule Your Room Invention Guide (included with the kit)
- Mac or PC with latest version of Scratch installed
- Spare 9V batteries

Prior Student Learning:
A basic understanding of circuits is useful.
An understanding of general programming concepts - input and output, algorithms, loops and debugging.

It is also useful to determine if any of the class are familiar with littleBits and Makey Makey, by asking questions such as:
- Who has used littleBits before?
- Who has used Makey Makey before?

Digital Technologies Summary

This activity introduces students to the idea of a digital system, where parts of the system are littleBits circuitry, connected to a Makey Makey littleBit, which is in turn connected to a computer program written in Scratch. The lesson introduces the students to the idea of systems thinking, focusing on how components are connected to each other and communicate using defined protocols.

Band | Content Descriptors
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7-8 | Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)
Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)

Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)

The particular elements of Critical and Creative Thinking addressed by this content description
Inquiring – identifying, exploring and organising information and ideas
  · Identify and clarify information and ideas
  · Organise and process information
Generating ideas, possibilities and actions
  · Consider alternatives
  · Seek solutions and put ideas into action
  · Imagine possibilities and connect ideas
Analysing, synthesising and evaluating reasoning and procedures
  · Apply logic and reasoning
Reflecting on thinking and processes
  · Transfer knowledge into new contexts

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<thead>
<tr>
<th>Element</th>
<th>Summary of tasks</th>
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| Learning hook          | We are going to use a Makey Makey bit to connect our littleBits prototypes to a computer program. First we need to explore what Bits we have and how they work and interact. We may want to go through the littleBits basics with the class (p2-3 in the Invention Guide): Anatomy, Color-coded categories, Magnets, Order of Bits. Ask students explore the bits in the kit so they know their features and functions. Pages 6-11 introduce all the available Bits and how they can interact. If students have not used Makey Makeys before, introduce them to the Makey Makey. This YouTube tutorial might be useful:  
  https://www.youtube.com/watch?v=-X3hb__YynM |

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<tr>
<th>Achievement Standards</th>
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<td>Students plan and manage digital projects to create interactive information. They define and decompose problems in terms of functional requirements and constraints. Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. They analyse and evaluate data from a range of sources to model and create solutions.</td>
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<tr>
<th>Learning Map (Sequence)</th>
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<tr>
<td>● Students explore the components of the littleBits Rule Your Room Kit</td>
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<tr>
<td>● Students create a simple Makey Makey integrated system, where the computer mouse is activated using sound</td>
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<tr>
<td>● Students create a simple Scratch program where a Sprite is moving/stopping as a sound is heard</td>
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<td>● Students reflect on their work and make suggestions for improvements or extensions</td>
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<th>Learning input</th>
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<td>1. Ask students to look at their Makey Makey bit and highlight the input and output connections. Remember the colour coding - input pink - output green.</td>
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<td>2. Explain that inputs can be digital or analogue. Digital has two states (on/off, high/low, or true/false) but analogue can take values in between. In our kits the button is digital and the dimmer is analogue - and they need to use the appropriate pins.</td>
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<tr>
<td>3. Now we are going to connect two of the bits to the Makey Makey bit, following the tutorial on page 15 of the inventor's guide.</td>
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4. Students turn the Makey Makey bit into click mode (see page 15 of inventor guide)

5. Students connect the Makey Makey bit to the computer using the micro USB cable, and point the mouse to a playable resource, such as the play button on a movie.

6. Students test the system.

7. Students write a Scratch program, where an animated Sprite is controlled by the mouse click.

8. In groups, students explore other ways in which the littleBits circuits can be connected to the Makey Makey bit and then to the computer.

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<tr>
<th>Learning construction</th>
<th>Students work in pairs to construct the circuit and write the Scratch program. The activity is about experimenting, trying new solutions, and debugging. Once students have successfully build the circuit, ask them to explore what other systems could be designed and connected. Encourage students to help each other and look for help on the internet. Ask a friend. Ask Google. Then ask the teacher.</th>
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<tbody>
<tr>
<td>Learning demo</td>
<td>While students are working in groups, ask questions to give them the opportunity to demonstrate their thinking and understanding: What challenges have you faced in building this circuit? What other bits could you add to your circuit and how would you use them?</td>
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| Learning reflection   | Remind students that littleBits is a prototyping platform but that the circuits we have been exploring exist in real-world products.  
  * Can you think of any exciting products that could be created with this sort of technology?  
  * What other components could be used as inputs or outputs? Consider everyday items that could be connected to the Makey Makey – see pages 24-25 in the inventor’s guide for suggestions.  

Ask students to think about what other digital systems could be designed with littleBits, Makey Makey and computer programs: what real-world problems could they solve? |
Assessment:

- Observation of students building littleBits circuits
- Successful control of the Scratch sprite using sound
- Teachers observe students creating their algorithms and debugging.
- Use questioning to elicit student understanding of the functions of littleBits and Makey Makey, the programming platform and their algorithmic thinking.
- You might take photos/videos of the students' work to document their progress – or in the final presentations.

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<tr>
<th>Criteria</th>
<th>Quantity of knowledge</th>
<th>Quality of understanding</th>
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<tr>
<td>Pre-structural</td>
<td></td>
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<tr>
<td>Algorithms</td>
<td>Circuit is built and Makey Makey is connected to computer.</td>
<td>Scratch code is written and input from the Makey Makey is captured.</td>
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<tr>
<td>Programming</td>
<td>Scratch code is written.</td>
<td>The terms input/output, code, or circuit may be used as a general description.</td>
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<tr>
<td>Vocabulary</td>
<td>No specific / technical terms used.</td>
<td>The terms input/output, code, or circuit are used as a general description.</td>
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Teacher/Student Instructions:

If using the mounting board:

- Snap your circuit together before pressing into the mounting board
- Press down Bitsnaps (the coloured edges) rather than the white circuit board

CSER Professional Learning:

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

7 & 8 Digital Technologies: Next Steps
Unit 2 - Next Steps 7 & 8
See: http://csermoocs.adelaide.edu.au/moocs

Further Resources:

1. Information about the littleBits Rule Your Room Kit and some example projects:
   http://littlebits.cc/projects
2. The littleBits Educator Guide, available online here:
   https://d2q6sbo7w75ef4.cloudfront.net/littleBitsEducatorsGuide_FINAL.pdf

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