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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 6 Science: Electricity**

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| ***BIG IDEAS:*****\*Electrical energy can be transformed into other forms of energy****\*Engaging students in creating technology rather than just consuming it*****Curriculum Expectations:*****Grade 6 Science: Matter and Energy****2.1 follow established safety procedures for working with electricity****2.2 design and build series and parallel circuits, draw labelled diagrams identifying components used in each, and describe the role of each component in the circuit****2.5 use technological problem-solving skills to design, build and test a device that transforms electrical energy into another form of energy to perform a function** |
| **Learning Goals:**“We are learning to…”**Create simple circuits** | **Success Criteria:** “We will be successful when…”**We have developed a better/stronger understanding of simple electronics** |
| **Lesson Overview:****This lesson will operate as a Science Lab, where students will learn through experimentation with partners/ small groups, using different circuit challenge cards.** |
| **Materials and Technology:** * Makey Makeys (1 per pair or small group)
* Alligator clips
* Prepared telephone wires (see Makeymakey.com)
* Tin foil
* Play dough
* Popsicle sticks
* Strawberries or other conductive fruits
* Small conductive items for switches: Copper braids, pennies, paper clips, etc.
* Circuit challenge cards
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| **Student Accommodations/Modifications:**  | **Lesson will be differentiated by:*** **Content, specifically:**
* **Process, specifically: Special needs students may require some EA/ Teacher support to complete**
* **Product, specifically:**
* **Environment, specifically:**
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| **MINDS ON: Getting Started** |
| Activate prior knowledge:* What do you know about circuits? Electricity?
* Safety procedures when working with electricity (safety hazards, dry hands, etc.)
* Vocab review: series/ parallel circuits, ground, LED, negative (short leg), positive, Scratch, switch, alligator clips, loop
 | -Whole-group discussion-Teacher poses questions-Record safety procedures on a chart for students to access throughout the lesson/activities  |
| **These ‘Circuit Challenge’ activities would come after some basic learning about circuits and electricity. The activities will be exploratory, where the students will learn through ‘making’ and doing with these hands-on activities. They will work together to figure things out, some may require a little guidance/ support.** **Centres will be set up with task cards and materials available.****Students may choose a partner (or small group – depending on how many MakeyMakeys you have) to work with.** |
| **ACTION: Working on it** |
| During this phase, the teacher may: • ask probing questions; • clarify misconceptions, as needed, by redirecting students through questioning; • answer students’ questions (but avoid providing a solution to the problem); • observe and assess; • encourage students to represent their thinking concretely and/or pictorially; • encourage students to clarify ideas and to pose questions to other students. | During this phase, students may: • represent their thinking (using numbers, pictures, words, manipulatives, actions, etc.); • participate actively in whole group, small group, or independent settings; • explain their thinking to the teacher and their classmates; • explore and develop strategies and concepts.  |
| Describe the task(s) in which your students will be engaged. What misconceptions or difficulties do you think they might experience? How will they demonstrate their understanding of the concept? How will you gather your assessment data (e.g., checklist, anecdotal records)? What extension activities will you provide? **Students will rotate through challenge activities over the next few ~~of~~ days (likely completing 2-3 activities per 60-90 minute period).****Students may have issues creating the circuits, finding a ground, positive/negative, finding objects that are conductive etc. You can support them by using guiding questions, allowing them to use technology or books for research, or having them use other students who were successful to give some guided support.****Use a checklist to keep track of when students complete tasks successfully, including anecdotal notes with troubles that students may have had. This will also give you the next steps you may need to work on in your Electricity unit.** **You may also take pictures and videos for assessment purposes, and also for kids to be able to reflect and write about their experiences at a later time.** **Provide STEM time or Genius Hour for students to retry challenges they had difficulty with, or extend their knowledge by ‘making’ using these ideas and principles.** |
| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher may: •bring students back together to share and analyse strategies; • encourage students to explain a variety of learning strategies; • ask students to defend their procedures and justify their answers; • clarify misunderstandings; • relate strategies and solutions to similar types of problems in order to help students generalize concepts; • summarize the discussion and emphasize key points or concepts.  | During this phase, students may: • share their findings; • use a variety of concrete, pictorial, and numerical representations to demonstrate their understandings; • justify and explain their thinking; • reflect on their learning. |
| ***Try to reflect each day after the completion of centres***-You can use pictures/videos of the students working to guide discussions.***Guiding Questions:***What did you find challenging? Why? What strategies did you use to problem-solve?How did you work together to complete the tasks?What did you discover that you did not know already?What would you like to try in the future using these materials?What would you do differently next time? |

Challenge Cards

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| Challenge 1:Simple Circuit: Can you figure out where to plug in the LED on the Makey Makey and complete a circuit by touching playdoh? (Remember that LEDs have a short leg to indicate the negative side. You need to create a loop for the current to flow!) | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngSimple Circuit Challenge 1 |

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| Challenge 2:Can you use people to complete the circuit? Can you add people and the LED still light up? How many people can be in your chain and still complete the circuit? | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngSimple Circuit Challenge 2 |

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| Challenge 3:Create a Makey Makey keyboard with tinfoil and popsicle sticks. (Hint you will need to create your own piano with Soundplant application or find a piano on Scratch that uses WASDF keys) | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngSimple Circuit Challenge 3 |

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| Challenge 4:Can you create human piano keys? Can play the piano by playing your friends? | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngSimple Circuit Challenge 4 |

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| Challenge 5:Building a Switch: Can you make a switch with Playdoh that will still light up your LED on the MM without using yourself or another person as a ground?  (Hint: You will need two alligator clips to Earth.) | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngBuilding on Simple Circuits Challenge 5 |

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| Challenge 6:Parallel Circuit: How can you create a parallel circuit that will successfully light up a second LED? (Hint: Where is your LED getting output from?) | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngBuilding on Simple Circuits Challenge 6 |

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| Challenge 7:Parallel Circuit: How many LEDs can you power? What ports on MM will allow you to power LEDs? (Hint: Earth is your ground/Attach your LED negative led to earth!) | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngBuilding on Simple Circuits Challenge 7 |

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| Challenge 8:Building a Switch: What other materials can you use to build your own switch? What materials work? What won't work? Why? | http://makeymakey.com/lessons/simple-circuit-challenge/images/logo.pngBuilding on Simple Circuits Challenge 8 |