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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 5 & 6 Science : Electric Circuits**

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| **Big Ideas:*** Electrical energy can be transformed into other forms of energy. (Overall expectations 2 & 3)
* Other forms of energy can be transformed into electrical energy. (Overall expectations 2 & 3)
* Electrical energy plays a significant role in society, and its production has an impact on the environment. (Overall expectation 1)
* Society must find ways to minimize the impact of energy production on the environment. (Overall expectation 1)

**Overall Curriculum Expectations :*** Evaluate the impact of the use of electricity on both the way we live and the environment;
* Investigate the characteristics of static and current electricity, and construct simple circuits;
* Demonstrate an understanding of the principles of electrical energy and its transformation into and from other forms of energy.
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| **Learning Goals :*** Demonstrate an understanding of electric circuits in an actual situation
* Design and construct simple electrical circuits
 | **Success Criteria :*** Recognize and describe the principal elements of an electric circuit
* Make the distinction between an electric circuit in series and an electric circuit in parallel
* Identify materials which are good conductors of electricity
* Plan and build a portable (mobile) circuit according to a preconceived task to be accomplished
* Explain how the electric circuit improves people’s quality of life

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| **Lesson Overview:**Over the course of this series of lessons, the student will :* Explore static electricity by doing experiments
* Compare the different types of electric circuit by making the 2 types (series and parallel)
* Construct a prototype circuit that is powered by electric energy
* Follow the technological problem-solving skills
* Use appropriate Science terminology
* Utilize E-textile technology, parallel and series circuits, along with other electricity concepts to communicate their results
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| **Materials and technology to be used:*** Conductive wires
* Batteries, bulbs, solar panels, “Lily Pad”
* Bells
* Tissue paper
* Construction materials
* iPads, laptops, and various apps
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| **Accommodations/Modifications:** * Form heterogeneous (mixed ability) groups keeping in mind different learning difficulties
* Suggest to students that they try to identify a real-world problem that needs solving
* Allow students to present their results in their own manner
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| **MINDS ON: Getting Started** |
| During this phase, the teacher will * Show a video to the class that sets up the lesson by presenting the 4 domains of electricity and the different devices that use electricity
* Discuss the different topics as a whole-group:
* Static electricity
* Electric circuits in series and in parallel
* Conductors and insulators
* Different means of generating electricity
* Ask questions to check their preconceived notions about energy, conductivity, and electricity
 | During this phase, students will :* Fill in a KWL chart (What I know, What I want to know, and what I learned) as a whole-group
* Watch the intro video and answer questions posed by the teacher
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| **Describe how you will introduce the learning activity to your students. What key questions will you ask? How will you gather diagnostic or formative data about the students’ current levels of understanding? How will students be grouped? How will materials be distributed?** Fill out the KWL chartStudents will be grouped according to the challenge they have chosen |
| **ACTION: Working on it** |
| During this phase, the teacher will: * Review the steps of scientific inquiry continuum
* Discuss safety protocols and proper ways to use materials
* Have students design then conduct experiments in order to find which materials conduct electricity the best
* Invite students to build the 2 types of electrical circuits, to make observations, and to construct a chart to list the advantages and disadvantages of each type of circuit
* Invite students to create a prototype that applies new knowledge and that solves a specific technological problem
 | During this phase, students :* Follow directions and organized themselves into groups based on the challenge they chose
* Describe the advantages and disadvantages of each type of circuit
* Test their product and verify that it solved the problem

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| **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?** * Ask students questions about the advantages and disadvantages of each type of circuit
* Experiments will be conducted by students so that they understand the basic principles of static electricity (energy source, conductive wires, accessories)
* Experiments will be conducted by students so that they can understand the difference between conductors and insulators
* They will read books and research online to determine good and bad conductive materials
* They will do research while planning their prototypes
* Assessment of the final product may be in the form of a rubric or checklist
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| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher can : * Ask students to complete their science journal, adding the following: what I’ve learned, what was easy, did I select the best materials for my circuit? Why or why not? How can I improve my circuit? Could I propose a better circuit to solve my technological problem?
 | During this phase, the students will : * Fill in their science journal
* Share their learning with the class
* Do a self-evaluation and a peer-evaluation
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| How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)? What key questions will you ask during the debriefing? Depending on their chosen topic, students will get an oral presentation checklist to help them with assessment. During the Maker Faire, students will present their circuit, including the challenge they had to problem-solve. They will also have to explain the steps they took during the construction phase, how their prototype works, and how they stayed safe over the course of their making. Finally, students will have to explain other sources of energy that could have been used to power their circuit (solar panels, wind turbine, batteries, etc.)  |