SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Environmental monitoring systems (temperature)	Gr 5 - Conservation of Energy & Resources

Lesson Plan

Description

In this lesson students will be able to use block-based coding to design, code, and build systems for environmental monitoring (specifically temperature) and then can improve upon their system to increase energy efficiency and usage. This can be done online using Tinkercad or physically with Micro:bits. Please see the slideshow for lesson details and instructions in the speaker's notes.

Learning Outcomes

Students will be able to:

- effectively demonstrate computational thinking strategies by writing functional code that serves a specific purpose.
- efficiently design, build, and code a functional system that senses the environment (temperature, etc.)
- troubleshoot a device and debug the system using a variety of strategies.
- showcase their system and explain how it works and the possible real-world applications for saving energy.
- work well with group partners demonstrating strong collaboration skills.

Specific Expectations

A2.1 write and execute code in investigations and when modelling concepts, with a focus on using different methods to store and process data for a variety of purposes.
A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades.
Conservation of Energy and Resources
E1.2 evaluate effects of various technologies on energy consumption and describe ways in which individuals can use technology to reduce energy consumption.
E2.1 identify a variety of forms of energy and describe how each form is used in everyday life.
E2.4 demonstrate an understanding that when energy is transformed from one form to another, some energy may dissipate into the environment in the form of heat, light, and/or sound energy.
E2.5 identify renewable and non-renewable sources of energy.

Introduction

This lesson will show you step-by-step how to develop systems and strategies to save energy and resources using automation and computational thinking with Micro:bits. Students will reflect on their role in energy use and the environment and then develop real-world solutions.

- What environmental or energy issues concern you the most?
- What are some meaningful solutions?
- Do you have any ideas that may not even exist yet?
- How can computational thinking help solve problems?

Action

After students have had some introductory lessons to Micro:bits (suggestions included in slideshow speaker notes) they will review the capabilities of Micro:bits, specifically the inputs and outputs, which are needed for developing computer logic and algorithmic thinking. Students will be empowered to code for climate, specifically temperature sensing and systems. Students will have scaffolded challenges from building a basic temperature sensor, a radio sensor capable of measuring temperature inside of an object like a car or refrigerator, to making a temperature alarm to alert others to be aware of changes and adjust accordingly. There is an opportunity for an advanced temperature alarm with the purchase of accessories like a speaker, light or motor. Students will learn about what debugging is and how to work their way through their code to figure out why it may not be working.

Consolidation/Extension

Students will reflect upon what they have learned and the possible applications.

- Why is it important to monitor our environment?
- How does this help us reduce energy use?
- Can you think of other ways to measure your environment?
- If you could build ANYTHING to help the environment, what would it be?
- What else could you automate for energy & the environment?

Students can also explore extensions of this activity including:

- Solar powered Micro:bits
- STEM design challenge graphing temperature inside of a vehicle before and after using a sun shield of their own design.
- Identifying energy transformations across their system.

Accommodations/Modifications

Not all students will have access to Micro:bits or the accessories mentioned in this lesson. The computational thinking strategies can be utilized with the Make Code Editor https://makecode.microbit.org/ or with advanced students using Tinkercad.

Assessment

Often with projects such as these, anecdotal assessment is always the richest. Seeing students and their "EUREKA!" moments and working through various challenges at their own level is incredible. There is also a rubric provided to quantify their work.

Additional Resources

Please see the slideshow for all links and resources mentioned in speakers notes.
https://docs.google.com/presentation/d/1ZFvDUQergH8uf2qXGB0VS0rb5fy-EOIkzgBMI3ZM6yg/edit?usp=sharing