Lesson Plan

Description

Efficiency is important in both energy conservation and in coding. Using only the energy you need helps the planet. Using the fewest lines of code makes troubleshooting while coding easier. In this lesson, students will look at efficiency related to coding and learn about renewable energy sources in the process.

Learning Outcomes

- Energy can be renewable or non-renewable
- Renewable energy replenishes, it is cleaner for the environment
- Non-renewable energy has a limited source, it is harmful to the planet
- Only use the energy that you need
- Coding uses efficiency to make it easier to troubleshoot or debut a program

Specific Expectations

C2.5 demonstrate an understanding that humans get the energy resources they need from the world around them, and that the supply of many of these resources is limited

A2.1 write and execute code in investigations and when modelling concepts, with a focus on creating clear and precise instructions for simple algorithms

Introduction

There are many sources of energy that humans can use. Unfortunately, many of those resources are limited, whether in the total amount of energy that we have or in our ability to use that energy.

Energy can be classified into renewable and non-renewable energy. Renewable energy is energy that comes from a renewable source that is constantly replenished. Renewable energy is considered green or clean energy as it comes from natural sources that are less hazardous for the environment. Examples of renewable energy are:

- Solar Energy
- Wind Energy
- Hydroelectric Energy
- Geothermal Energy

Non-renewable energy is energy that has a limited amount of the resource. Once it's used, it's gone. Non-renewable energy is less expensive but in addition to having a limited resource, it can be bad for the environment. Examples of non-renewable energy are:

- Oil
- Gas
- Coal

Regardless of the form of energy, we need to be careful with how much energy we use. Non-renewable energy will eventually run out, so wasting energy will deplete that source faster. Renewable energy while able to replenish is still limited in its technology and how much energy it can produce. Only 18.9% of Canadian energy is renewable. If we use that energy faster than we can generate it, we are forced to use non-renewable energy sources. In both instances, it becomes important to conserve energy and use only as much energy as we need.

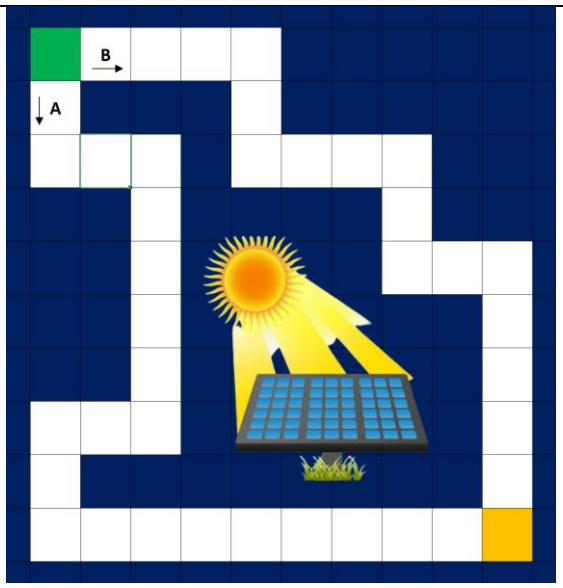
We can look to various Indigenous communities as an example of how to use energy. The Seventh Generation Principle is based on a Haudenosaunee philosophy that the decisions we make today should result in a sustainable generation seven generations into the future. The Haudenosaunee recognizes that humans do not own the world and its resources, rather they believe that humans must live a balanced life with the environment. That means to only use what you need, and to live in a way that will allow the world to be harmonious and healthy for generations to come.

Action

One way we can conserve energy is to think about our efficiency. For example, you can use more efficient light bulbs, such as replacing incandescent light bulbs with LED light bulbs which use 75% less energy.

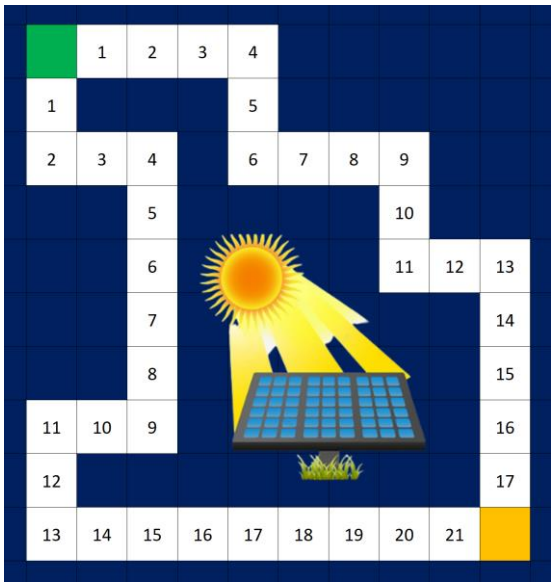
Efficiency is also a very important concept in coding. When programmers code, they are not the only ones working on their project. It is important that programmers use the fewest lines of code possible to accomplish a task because this makes it easier to find mistakes and get help from others.

In this activity, students will explore the concept of efficiency. There are four handouts associated with this activity. Each handout has a map that uses grid spaces for traversal. Each grid will represent a unit of energy. Students will have to choose the most efficient route to get from the beginning (green) to the end (orange). Here is an example:



There are two routes that students can choose, route A or route B. Students will have to count the spaces and choose the route that uses the least amount of energy. This represents the most efficient route.

As can be seen from the image below, route B is the more efficient option. It only takes 17 steps compared to route A which takes 21.



Consolidation/Extension

As an extension to this activity, students can also be encouraged to code the steps to travel their most efficient route. This works as an unplugged coding activity that encourages the students to make an algorithm for the route being travelled. Using the previous image and route B, the 17 steps that were travelled can be broken down into smaller steps to show the route taken. In this instance, here is the route travelled:

1. 4 steps right (1-4)
2. 2 steps down (5-6)
3. 3 steps right (7-9)
4. 2 steps down (10-11)
5. 2 steps right (12-13)
6. 4 steps down (14-17)

This is a good activity for students as breaking down a large task into smaller steps is a key concept gained from coding and a practice done by most programmers. The accompanying handouts are all set-up to allow students to decompose the route that they chose into smaller steps. Solutions are also provided.

Accommodations/Modifications

- The image of the map can be projected on a smart board and be done as a group activity
- This activity can be done physically using chalk outside, or tape on the floor

Assessment

The student handouts can be used as Assessment *for* Learning or Assessment *of* Learning. Gather information from the students throughout the activity to gauge their level of understanding or collect the handouts to provide a summative evaluation.