SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

All sorted	Grade 1 and 2

Lesson Plan

Coding Tool	Ozobots
Time Required	2 periods

Math Curriculum Connections

Algebra
C3. Coding

Overall Expectations
C3. Solve problems and create computational representations of mathematical situations using coding concepts and skills

Specific Expectations
C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential events

Science Curriculum Connections

Needs and Characteristics of Living Things
2.2 investigate and compare the basic needs of humans and other living things

Materials, Objects and Everyday Structures
3.6 distinguish between objects and materials found in nature and those made by humans

Movement
2.3 investigate the structure and function of simple machines

Properties of Liquids and Solids
3.1 identify objects in the natural and build environment as solids or liquids

Description

Sorting is an important part of science, used to identify and compare key traits. Whether it be living and non-living things, natural and human-made material, or solids and liquids, all of these are examples of sorting in science. In this lesson, students will explore sorting through code, using if/then conditional statements. Students will then apply their learning using colour coded conditional statements to control an Ozobot.

Success Criteria

- The 1st and 2nd grade students will be able to sort objects in science using conditional statements
- The 1st and 2nd grade students will be able to code an Ozobot using colour codes to navigate a path or a maze

Materials and Media

- Sorting Handout
- Coding Guide
- Ozobots
- Paper
- Washable Markers (Black, Red, Blue, Green)

Computational Thinking Skills

This lesson focuses on the concept of conditional statements. These are used in coding to execute a condition if a statement is true. We can also call these conditions ***if/then*** statements. Conditions help computers make decisions but we can also look at them as they shape decisions in our day to day lives. For example, if the alarm goes off in the morning, then I wake up.

Students will look at conditional statements in an offline setting and also have the opportunity to use them with Ozobots. Ozobots are small robots that have built-in line following functions and colour coded conditional statements. The robot has light sensors that act as their eyes and ***if*** they see a certain colour code, ***then*** they perform a certain function. They are a great introductory coding tool that can be used on paper.

Introduction

The coding and math element of this lesson will help familiarize students with conditional statements in a few different ways. In the first unplugged activity, students will play a game that has them perform different actions when certain conditions are met, similar to what we'd see in a game of Simon Says. In the second unplugged activity, students will combine conditional statements with science in a sorting activity. Looking at the science curriculum, sorting is an important part of learning in grade 1 and 2. Using the unplugged activity, students will be able to investigate and compare in ways that connect with the following curriculum strands:

- Needs and Characteristics of Living Things (Grade 1)
- Materials, Objects and Everyday Structures (Grade 1)
- Properties of Liquids and Solids (Grade 2)
- Movement (Grade 2)

Finally, in the coding activity, students will use an Ozobot that follows code to show how robots use conditional statements to perform different actions. The Ozobot maze can also be used to talk about energy and its uses.

Action

Unplugged Activity

This activity has students responding to a given ***if*** with the appropriate ***then*** action. It has some similarities to a Simon Says game where the conditional statement can be seen as:

If (Leader says: Simon Says)
Then (Imitate the action)
Else (Don't do the action)

Rather than having a static ***if/then*** statement to follow, students will be given a changing conditional statement. When we add an ***else*** to the statement, we can build our conditionals into comparisons. If space and/or restrictions allow, this can be done as a physical activity in the classroom. Students line up single-file, through the middle of the classroom, the teacher states the conditional. The ***then*** action can be 'go to the left', the ***else*** action will be 'go to the right'. Students walk from the middle to the side of class. This results in groups of students on each side of the classroom sorted by the condition.

Here is an example of an ***if/then/else*** statement that could be used in this game:

If (you are wearing green)
Then (go to the left)
Else (go to the right)

If space or other restrictions don't allow for student movement throughout the class, the ***then/else*** statements can be altered to hand gestures so that students can perform them from their seats.

If (you are wearing green)
Then (raise your left hand)
Else (raise your right hand)

You can add complexity to the game by adding another condition to give 3 sorted groupings.

If (you are wearing green)
Then (raise your left hand)
Else if (you are wearing red)
Then (raise your right hand)
Else (raise both hands)

Sorting Statements

This activity has students sorting images with arrows to the right or left of the page based on a given conditional statement. This is a simple activity that can be applied to anything you want to sort! The conditionals included in the handouts relate to the science curriculum. Below is an example.

If (the image is a living thing)
Then (circle it and draw an arrow to the left)
Else (circle it and draw an arrow to the right)

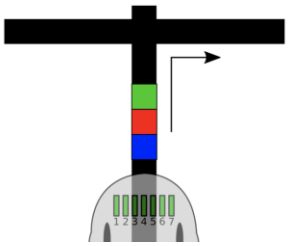
There are 4 documents included for the activity with this lesson:

1 – Living things or not
2 – Natural materials or not
3 – Solids or not
4 – Simple Machines or not

Math Activity

The final part of the lesson has students using colour codes to navigate the Ozobot through a maze. In general, the robot will follow the line until it reaches a colour code. Different

combinations of colours indicate different conditional statements. For example, ***if*** the robot sees blue + red + green, ***then*** it will go right at the next turn.



The thickness of the lines and the colour code need to be consistent in order for the Ozobot to read the code. To make sizing easier for students, the Ozobot mazes have spaces where students can simply fill in the colour codes. A colour code guide is included with this lesson.

Students should be given the opportunity to experiment with the different codes to see how the Ozobots behave when encountering them. After they have practiced filling in code of their choice, they can be challenged to complete the code to navigate the maze before testing it out with the Ozobots. Once they are satisfied that their code will direct the Ozobot down the correct path, they can test their code.

The goal of the Ozobot in the maze is to collect energy so that it can grow. This is meant to be a discussion point about energy and growth in living (or non-living) things. The robot can collect energy(electricity). It needs to have energy to light up and to move. No matter how much energy it collects, though, it won't be able to grow.

*Before starting with the Ozobots, it is important to calibrate them as it will improve accuracy depending on the setting. The Ozobots also work best when there is the least amount of shadows. All Ozobot handouts include a calibration dot.
To calibrate: Hold the power button down for 2 seconds until the light flashes white. Quickly place the Ozobot onto the black calibration dot. Let's look at the last calibration step as a conditional statement:

If the Ozobot blinks green and moves forward
Then you have calibrated successfully
Else if the Ozobot blinks red
Then you restart the calibration

Closure and Assessment

- By the end of the lesson, students should be able to sort objects in science using conditional statements. Teachers can watch to see if students' actions match the condition as a form of assessment for learning.
- The handout can be collected by teachers and used for assessment of learning. Look for accuracy the sorted objects to assess that students can apply the key concepts and skills related to the activity.

Adaptations

- The unplugged If/Then game can be adapted and played in different ways. Consider using conditions that students can do online, sitting down or to accommodate different needs.
- Students can draw their own paths to collect energy instead of using colour codes.

Extensions

- Look for other things that can be sorted in science, or in everyday life.
- Challenge students to make their own Ozobot mazes.