SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Caring for Crops	Grade 3 - Growth & Changes in Plants

Lesson Plan

Description

In this lesson, students will explore emerging technologies that are helping farmers take care of their crops. They will then code a robot to navigate a series of farm field maps to mimic caring for their crops.

Learning Outcomes

Students will be able to:

- Describe ways in which emerging technology is currently or could be used to assist farmers in taking care of crops.
- Describe how weeds can hinder the growth of crops/plants.
- Code a robot to efficiently navigate a path and perform simple actions along the way.
- Sequence
- Identify errors and alter existing code to remove errors

Specific Expectations

Science

A2.1 write and execute code in investigations and when modelling concepts, with a focus on testing, debugging, and refining programs.

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life.

A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems.

B2.1 describe the basic needs of plants, including the need for air, water, light, heat, nutrients, and space, and identify environmental conditions that may threaten plant survival.

Math

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

C3.2 read and alter existing code, including code that involves sequential, concurrent, and repeating events, and describe how changes to the code affect the outcomes

Introduction

Using the provided slides, introduce an emerging technology - the Autonomous Laser Weeder developed by Carbon Robotics. After watching two videos showing how the robot operates and learning more about what it does, have students launch into a think-pair-share to answer some thought-provoking questions. Discussion points for each question are included in the presenter notes in the slide show.

Following this case study, inform the students that their task is to code a robot to navigate through farm fields and help care for crops. Using the provided slides, go over the commands they can use (forward, left turn, right turn, and weeding), as well as the rules for the task which are as follows:

- The robot must start on the start square, pointing in the direction of the arrow.
- The robot must drive over every crop to water it.
- For crops with a red star, the robot must eliminate weeds while on that square.

As a class, go through an example together. Emphasize that there are many possible solutions for each map, but we want to try to find the most efficient (uses the least number of steps). After solving as a class, watch a video walkthrough that shows a robot following the code step-by-step. Rewatching this walkthrough video might be helpful for students who are struggling with the activity.

Finally, introduce the concept of bugs and debugging. This will be useful not only to solve the debugging portion of the activity but for students to debug their code when they make a mistake. As a class, debug some example code by identifying the problem and then fixing the code.

Action

In partners or individually, whichever you prefer, have students work through each of the 3 field maps. This can be done entirely as an unplugged activity, or using a robot system like Vex 123, Bee-Bot, Edison, or any other platform that allows you to code with simple forward, left, right, and at least one other action (make a sound, change light colour, etc.)

Consolidation/Extension

A suggested extension activity is to have students create their maps for a partner to solve using the "Unplugged Field Map Cards".

Accommodations/Modifications

This lesson can be adapted to work with many different robot platforms (Vex 123, Bee-Bot, Edison, etc.) or simply used as an unplugged coding activity.

Some students may struggle with keeping track of the state of the robot while coming up with the code. These students may benefit from using a paper robot token (found on the "Unplugged Field Map Cards" page) and placing it on the map, moving it along as they decide each step.

Assessment

An answer sheet has been provided to correct student work.

Please note that the answer sheets provide the most efficient solution. Students may identify another way of navigating the maze that can be correct even though it is not the most efficient.

Additional Resources

Carbon Robotics - Autonomous Laser Weeder: www.carbonrobotics.com/autonomousweeder