SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Exploring Block-Coding using Ozobots	Gr. 7 - Understanding Structures & Mechanisms: Form & Function

Notes: Start with Lesson 1 (Colour Coding) if students are new to the Ozobot

Ozobot - Codeblocks

Coding Tool	Ozobot
Cross-curricular	Math, Science

Big Ideas

Science

- Structures have a purpose
- The form of a structure is dependent on its function
- The interaction between structures and forces is predictable

Math

- Mathematical Process
- Number Sense - operational sense (bisecting)
- Measurement - area, real-life application of measurement
- Geometry & Spatial Sense - angles, lines, bisectors, properties

Specific Expectations

Science

- **1.1** evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs (e.g., function; efficiency; ease of use; user preferences; aesthetics; cost; intended lifespan; effect on the environment; safety, health, legal requirements)
- **2.6** use appropriate science and technology vocabulary
- **3.1** classify structures as solid structures (e.g., dams), frame structures (e.g., goal posts), or shell structures (e.g., airplane wings)
- **3.4** distinguish between external forces (e.g., wind, gravity, earthquakes) and internal forces (tension, compression, shear, and torsion) acting on a structure

Math

- Geometry & Spatial Sense
  -
- Measurement
  - solve problems that require conversion of units of area
- Geometry & Spatial Sense
  - plotting points
  - identify, perform, and describe dilatations
  - create an analyze designs

Description

This lesson builds on the first exploration by using block-coding with the Ozobot. By providing the same list of guidelines, students will be able to explore movement using the OzoBlockly app. This can be transferred through any type of device (e.g., ChromeBooks, Mac, personal devices). Students will engage in a Knowledge Build at the end to consolidate shared learning from the past 2 lessons (e.g., provocation: what type of structure is an Ozobot? What are the benefits of Colour-Coding and Block Coding?). This will lead into discussion of their final task: build a structure which withstands an external force (wind, earthquake) and/or an internal force (tension, compression, shear, torsion). These forces will be replicated through a block-coded Cue robot. Examples may be: a bridge which the Cue must travel across (internal force - compression AND/OR external force - earthquake); a goalpost (internal force - tension AND/OR external force - wind).

Materials

- Ozobots
- 50+ minute period
- Handouts
  - Lesson 2 - Teacher Ozobot Block Coding Information
  - Lesson 1 & 2 - Coding Goals
- Technology/Devices for Ozoblocky - https://ozoblockly.com/
- Knowledge Building Scaffolds: pg.42

Computational Thinking Skills

Iterative Thinking
- students will be tinkering & exploring a basic form of coding

Logic & Evaluation
- how to operate the tools

Algorithm
- making steps and rules to complete specific functions

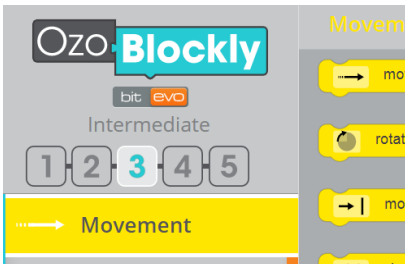
Decomposition
- focusing on one aspect at a time

Debugging
- finding and fixing

Abstraction
- adding in additional functions/features (e.g., lights, sounds) when completing the task

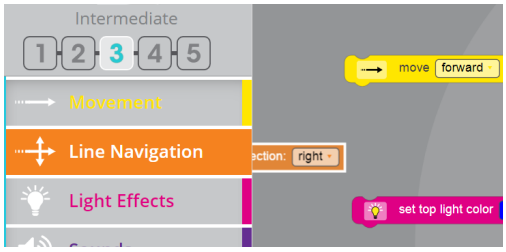
Introduction

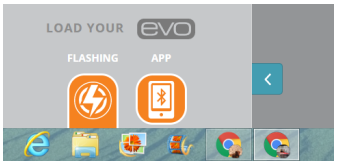
- Discussion
  - review previous lesson on colour-coding
  - modification/accommodation: review anchor charts ahead of time
- Discussion about block coding and prior experiences (e.g., Scratch)
  - importance of giving detailed instructions
- Review activity
  - using the same guidelines as the previous lesson (reflex, 65°, bisect, shell, solid, frame, 25cm^2), block-code the Ozobot to fulfil the task
- Review purpose of the lesson
  - to Codeblock a structure that has a specific purpose
  - point out the different coding levels on the left (e.g., Pre-Reader, Beginner, Intermediate, Advanced, Master)
- Build success criteria together prior to beginning, as well as during their build (e.g., working document)
  - terminology used
  - factors and considerations kept in mind
  - use of computational skills

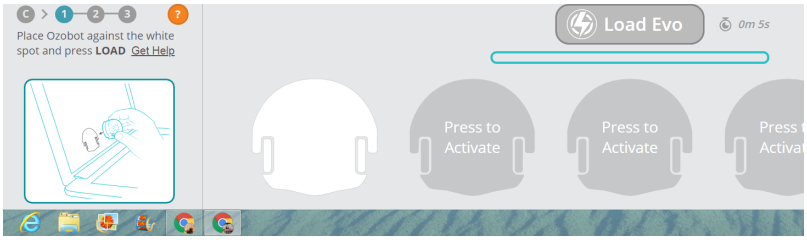


Action

- Groups of 2, 3 max
  - circulate to prompt or guide learners if needed
- Tips
  - make sure the Ozobot is calibrated
    - https://files.ozobot.com/stem-education/ozobot-calibration-tips.pdf
  - if students do not wish to keep the block, they can drag and drop it back to the menu bar on the left
  - to load the Ozobot, click on the bottom left of the screen for step-by-step instructions
- Goals
  - students will create algorithms, block-coding Ozobot movement to create specific angles, bisector(s), structures (shell, frame, solid), show area of 25cm^2; combine these movements together rather than independent







- Connection
    - pause for informal discussion; what do you notice? Are you finding this easier or harder to navigate? How come? What algorithms are you creating?
    - circulate to have conversations specific to coding: how have you been debugging? What algorithm works best to find the area?

Consolidation/Extension

- Thumbs Up/Down/Side - how well did you understand how to block-code? (add on other questions appropriate for your specific class)
- Quick discussion about prior knowledge going in, and what they understand now
- Review Take Home
    - Remember - think about a structure to create which is important to you - may be something modified or adjusted that already exists, or something completely new (e.g., bridge, building, goal post, etc)
    - this structure must perform a function (e.g., has a force acting on it, supports a load, etc.)
    - materials - will have 2 periods to build - may bring in your own materials, or let teacher know what needs to be supplied
        - examples: popsicle sticks, hot glue, jinx-wood, snap cubes, blocks, newspaper, duct tape, masking tape

Assessment

- anecdotal from their exploration
    - learning skills
    - computational thinking
- based on the co-created success criteria
    - descriptive feedback given to each student for lesson 2's creation

Additional Resources / Information

- Approximately 4 periods could be spent on building the structure and a focused review on internal/external forces, types of structures
    - while these lessons are occuring, small groups of students can explore the Cue robot to become familiar with its block-coding
- Links
    - Teacher Block-Coding Guide
        - https://docs.google.com/document/d/1_CaS5-oVCJOjIzxyx_jbq11wxZFagfpYnGBoij4cWco/edit?usp=sharing
    - Knowledge Building Scaffolds

- http://thelearningexchange.ca/wp-content/uploads/2017/04/Knowledge-Building-Booklet-Accessible-1.pdf