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| Space Explorations | Grade 9 Science – Astronomy (SNC1D, SNC1P) |
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| <h2 style="margin: 0;">Lesson Plan</h2> | Coding Tool | Ozobot |
| | Cross-curricular | Math (Measurement & estimation) |

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| <p>Big Ideas SNC1D D1. assess some of the costs, hazards, and benefits of space exploration and the contributions of Canadians to space research and technology</p> <p>Big Ideas SNC1P D1. analyze the major challenges and benefits of space exploration, and assess the contributions of Canadians to space exploration;</p> <p>Learning Goal(s):</p> <ul style="list-style-type: none"> • I can identify challenges faced and benefits with space exploration. | <p>Specific Expectations (SNC1D) D1.2 assess some of the costs, hazards, and benefits of space exploration (e.g., the expense of developing new technologies, accidents resulting in loss of life, contributions to our knowledge of the universe), taking into account the benefits of technologies that were developed for the space program but that can be used to address environmental and other practical challenges on Earth (e.g., radiation monitors and barriers, sensors to monitor air and water quality, remote sensing technology, fire-resistant materials) [AI, C]</p> <p>Specific Expectations (SNC1P) D1.1 research the challenges associated with space exploration, and explain the purpose of materials and technologies that were developed to address these challenges and how these materials and technologies are now used in other fields of endeavour (e.g., robotic arm technology developed for the space program is used in industry to handle hazardous chemicals; synthetic materials developed to protect astronauts are used in fire-fighting equipment) [IP, PR, AI, C]</p> |
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Description
 Students get to explore first hand and experience similar challenges faced with space exploration using Ozobots. Students will be given a challenge to program their Ozobots to complete an exploration mission. Students will then have a chance to reflect, relate and research obstacles they faced in their mission to the challenges of space exploration.

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| <p>Materials</p> <ul style="list-style-type: none"> • Computer per group • One Ozobot per group • Document camera • Projector • Internet access | <p>Computational Thinking Skills</p> <ul style="list-style-type: none"> • Algorithmic thinking • Problem solving • Conditional statement <p>Prior knowledge of block-coding will be beneficial</p> |
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Introduction

- Before we can identify the challenges with space exploration, ask your students to brainstorm the question: Why does space exploration matter? This can be done through a think, pair, share activity using chart paper, Google Doc, small whiteboard, etc. Discuss students' findings as a class, then show the video found below.

- 5 Reasons Space Exploration Matters to You | What the Stuff?!
<https://www.youtube.com/watch?v=StzfjkdLrLSI>

Action

- Have students in groups of two.
- Introduce students to the Space Exploration challenge (Earth to Mars).
- **Goal:** To get your rover (Ozobot) from Earth to Mars without falling off the projected path. The trick is that they cannot use the Space Exploration Challenge handout to test their program. They only get one attempt to make it to Mars safely, keeping it on route. They may try to replicate, measure, etc. to test their Ozobot.
- Explain how the Ozobot works and go through the basics of Ozo-Blockly:
<https://ozoblockly.com/editor?lang=en&robot=bit&mode=2>

- Once every group is confident in their program, have the class watch each group's rover (Ozobot) attempt the challenge. Depending on the size of your class, you can use a document camera to project the space exploration challenge handout or gather around a large table. Successful or not, each group gets only one attempt.
- Pair up the groups of two to make groups of four. Give students some time to answer the questions found on the Space Exploration Challenge handout. Have each group discuss their findings with the class once ready.

Consolidation/Extension

- Hand out a copy of "Space Technology Grand Challenges" or provide the link:
https://www.nasa.gov/pdf/503466main_space_tech_grand_challenges_12_02_10.pdf

 - Have each group pick one grand challenge to research the topic and identify what is being done to tackle the program. Make sure each group has chosen a different grand challenge. Allow the students to present their findings in multiple ways (i.e. Google Doc, Google Slides, etc.) Make sure students reference their work and explain in their own words.
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Assessment

- **Assessment for Learning:** Evidence of students meeting the learning goals through observations, conversations and product (Space Technology Grand Challenge group task).
 - **Assessment of Learning:** Peer and self-assessment as students develop and tweak their own programs and discuss possible challenges humanity faces in space exploration.
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Additional Resources

- **Ozoblockly Getting Started Guide Link:**
<https://files.ozobot.com/stem-education/ozoblockly-getting-started.pdf>
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