

Living Space

Instructional Design - At a Glance



Overview

This Action Project gives educators the opportunity to integrate science and coding in a unique and engaging way during the 2018-2019 school year and coincides with the mission of Canadian astronaut David Saint-Jacques. As part of the project, students will explore how environmental conditions influence mental and physical health and identify the best conditions for healthy living, learn to code microcontrollers, communicate findings and make data-driven decisions based on analysis and research.

Suggested Timing: 6 - 8 class periods plus time outside of class for project work

Context

In late 2018, Canadian astronaut David Saint-Jacques will be experiencing first-hand the environmental conditions of the International Space Station (ISS). As humans spend longer periods of time living in space, an understanding of the impacts of environmental conditions such as temperature, humidity and carbon dioxide levels on health and well-being become increasingly important. Environmental conditions are closely monitored by ground personnel using sensor technologies that can alert them to potentially dangerous conditions. This knowledge is important not only on the ISS, but also on Earth, and someday maybe even for a human colony on Mars!

Subjects/Skills

- **Topics Focus:** Space Science, Environmental Science, Computer Science
- **21st Century Skills Focus:** Critical Thinking, Communication, Collaboration, Creative Thinking
- **Computational Thinking Concepts:** Inputs & Outputs, Sequences, Events, Repetition, Conditionals, Variables, Data
- **Computational Thinking Practices:** Algorithmic Thinking, Pattern Recognition, Decomposition, Abstraction

Big Idea

As we look forward to expanding space exploration into long-duration, long-distance space travel and living, we need to understand how to monitor and mitigate the impacts of environmental factors on human health.

Learning Goals

- Understand Canadian contributions to space research
- Understand how environmental factors can affect physical and mental health both on Earth and in space
- Make data-driven decisions about the conditions of the learning environment
- Communicate information about the project using a digital format

Learning Activities

- Learn about David Saint-Jacques and his 2018-2019 mission to the ISS
- Gather information about optimal indoor environments
- Use a block-based coding language (MakeCode) to program physical devices
- Collect, record, upload, download and analyze data about environmental conditions in the classroom and aboard the ISS
- Develop a classroom environment improvement plan using SMART goals
- Share project results in the form of a digital presentation

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Lesson	Purpose	Science Component	Coding and Computational Thinking Component	Suggested Timing*
Minds-On 1	Introduction to the Project	Students will watch a video featuring David Saint-Jacques which discusses how the environmental conditions on board the International Space Station (ISS) affect the mental and physical health of the astronauts. Students will then complete personal surveys about the indoor conditions of their classroom.	Students will apply the Computational Thinking concepts of sequences, repetition and outputs as they code a simple animation in a block-based coding environment called MakeCode.	Science: 30 - 40 min. Coding: 30 - 50 min.
Minds-On 2	Understanding Indoor Environments	Students will participate in an information-gathering activity to learn about how various indoor environmental conditions affect physical and mental health.	Students will learn how to code an accelerometer to create a step-counter as a way of understanding the role that sensors play on the ISS.	Science: 30 - 40 min. + research time Coding: 30 - 50 min.
Minds-On 3	Coding and Using Sensors for Measurement	Students will discuss what temperature is like outside the ISS.	Students will apply the Computational Thinking concept of variables in order to code and use the temperature sensor on the micro:bit. At this time, they will also learn how to set up and use the class sensor array.	Science: 10 - 20 min. Coding: 20 - 40 min.
Action 1	Collecting & Organizing Data about Environmental Conditions	Students will collect, record and upload data about the environmental conditions in their classroom and the ISS into a national database. They will then download and graph the data.		40 - 50 min. + time for data collection
Action 2	Improving Classroom Conditions	Students will develop an action plan for improving classroom conditions based on their data analysis.	Students will collect, record, upload and download data about their modified classroom environment.	Science: 40 - 60 min. + time for data collection
Consolidation	Analyzing & Communicating Data: Telling the Story	Students will analyze and communicate conclusions about the data gathered through the project using a digital format. Supplemental/alternative tasks are included in the Extensions section.		Science: 30 - 50 min. + time to prepare and present results

*Timing will vary depending on student experience and interest

