

## Introduction to the Project

Students will be introduced to the project by Canadian astronaut David Saint-Jacques. Students will complete personal surveys about the indoor conditions of their classroom and they 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 for micro:bit.

**Suggested Timing:** Science 30 - 40 min., Coding 30 - 50 min.

### Success Criteria:

*Students will:*

- Identify the Canadian research to be done by David Saint-Jacques aboard the ISS
- Identify the abiotic factors of an indoor environment
- Code a basic program to simulate a beating heart with a block-based coding language
- Upload programs onto the micro:bit

### Student Prior Skills and Knowledge:

- None

### Materials:

Note: All of the activities in this lesson can be done online and submitted digitally.

- BLM M1.1:** Admit Slip [[.doc](#)] [[.pdf](#)] [[fillable pdf](#)] - 1 per student
- BLM M1.2:** Living on the ISS [[.doc](#)] [[.pdf](#)] [[fillable pdf](#)] - 1 per student
- BLM M1.3:** Classroom Environment Survey [[.doc](#)] [[.pdf](#)] [[fillable pdf](#)] - 1 per student
- Minds-On 1 Guided Materials** [[.pdf](#)]
- micro:bit Quick Start Instructions** [[.pdf](#)]
- micro:bit Safety Guide for Educators** [[.pdf](#)]
- micro:bit Safety Guide for Students** [[.pdf](#)]
- Video about the environmental conditions on the ISS featuring David Saint-Jacques (can be viewed online in [Minds-On 1.1 Step 2](#))
- Equipment to show a video (if showing during class time)
- micro:bits (with USB cords)\* - 1 per 2/3 students
- Computers – PCs, chromebooks, laptops, etc. On iPads and tablets the micro:bit app may need to be installed (<http://microbit.org/guide/mobile/>)
- Access to internet and MakeCode website (<https://makecode.microbit.org/>)

\*The coding activity does not require the micro:bits and can be done using only the online simulator.

[letstalkscience.ca/livingspace](http://letstalkscience.ca/livingspace)

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### Preparation:

- If students are not using the online resources, including fillable pdfs, BLMs will need to be printed.
- Set up equipment to show a video (if showing during class time).
- Sign out computer lab, laptops, chromebooks, etc., ideally one per 2-3 students.
- Familiarize yourself with the micro:bit and how it works using the **micro:bit Quick Start Instructions**.
- Review the **micro:bit Safety Guide for Educators**.
- For Part M1.3, have micro:bits and Guided Materials ready.

### Implementation Options:

- The activities in this module can be done entirely online and submitted digitally.
- The questions online can be used instead of, or as well as, a class discussion.

## Minds-On 1.1: Introduction to the Project

### Educators

Step 1

Provide students with **BLM M1.1** and have them respond to the questions on paper or online using the fillable pdf found in the Student Module. These questions can be used for formative assessment.

Step 2

Provide students with **BLM M1.2** and have them respond to the questions on paper or online using the fillable pdf found in the Student Module while viewing the video.

After watching the video, have students share their responses.

### Students

Answer the questions on **BLM M1.1** on paper or online using the fillable pdf.

As you watch the video, answer the questions on **BLM M1.2** on paper or online in the Student Module.

Be prepared to discuss your answers with the class.

## Step 3

Explain to students that as part of this project they will be personally assessing the environmental conditions of their classroom environment. Discuss/define “environment.” As a class, brainstorm factors that could affect the environment inside the classroom.

Think about all of the things that make up the “environment” of our classroom.

**Alternative implementation:** Students answer question 1 online in Minds-On 1.1 Step 3 of the Student Module.

### Our Classroom Environment

- How bright it is (light)
- How warm it is (temperature)
- How stuffy it is (air)
- How dry it is (humidity)
- How noisy it is (sound)

Encourage students to think of the classroom like a habitat and identify the abiotic (non-living) factors.

Once students have listed all of the factors that they can think of, have students individually think about which would be the three most important. Have students share and justify their ranking.

Share your responses to the questions during the class discussion.

Use probing questions such as:

- *What do you think are the three most important factors?*
- *Why do you think that factor is important?*
- *How does the factor affect you physically?*
- *How does the factor affect you mentally?*
- *Why do you think people react to the factors differently?*

**Alternative implementation:** Students answer questions 2, 3, 4 in Minds-On 1.1 Step 3 of the Student Module.

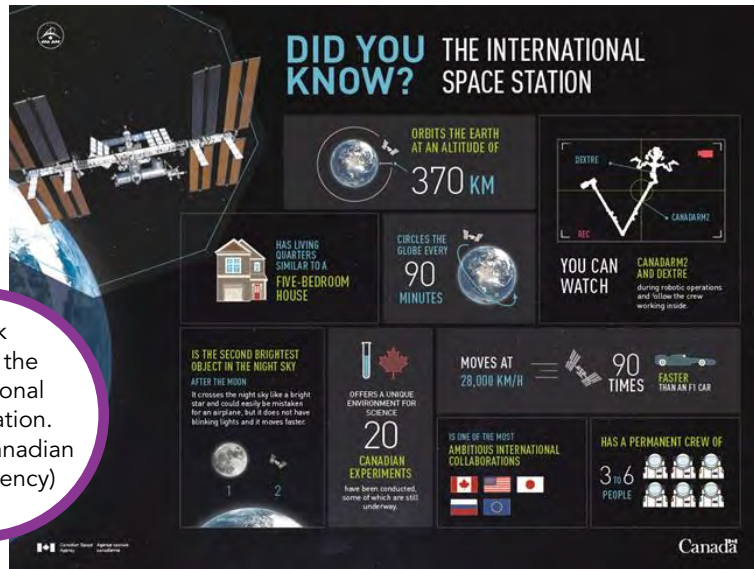


**Step 4**

Have each student complete the survey on **BLM M1.3** on paper or online using the fillable pdf in the Student Module. Emphasize that there are no right or wrong answers.

Answer the questions on **BLM M1.3** on paper or online using the fillable pdf in the Student Module.

**Alternative implementation:** Students could respond to the survey questions using a show of hand or anonymous ballots



Quick facts on the International Space Station. (Source: Canadian Space Agency)

**Minds-On 1.2: Your Heartbeat**

**Educators**

**Students**

**Step 1**

Have each students feel for his/her heart beat by placing a hand on his/her chest.  
Have students use words and/or actions to describe the rhythm (e.g., squeeze hand open and shut, words lub-dub, tap desk, etc.).

Put your hand on your chest to feel your heart beat.  
How can you describe the rhythm of your heart beat?

**Step 2**

Have students measure their resting heart rates.  
Time permitting you could have students run on spot and then re-measure their heart rates.

Find your pulse by placing two fingers over your wrist. Once you have found it, count the number of pulses in 15 seconds.  
Multiply this by 4 to calculate your resting heart rate in beats per minute (bpm).



- 3 Discuss factors that affect their heart rates and the heart rates of astronauts.

Use probing questions such as:

- *How might stress affect your heart rate?*
- *How might exercise affect your heart rate?*
- *How might your fitness level affect your heart rate at rest?*
- *How might being launched in a rocket affect an astronaut's heart rate?*

Answer the questions:

- *What sort of things do you think affect your heart rate?*
- *What sort of things do you think affect an astronaut's heart rate?*

## Minds-On1.3: Code a Heartbeat

**NOTE:** Students can do this activity using the online simulator only.

### Educators

#### Step 1

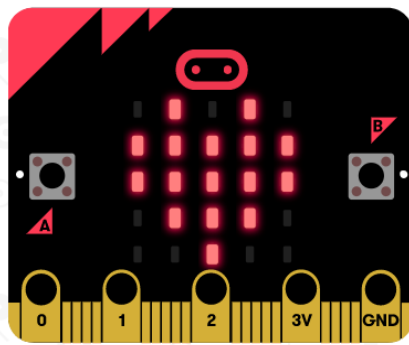
Have each small group of students (2-3) turn on and log into a computer/laptop/chromebook/iPad/tablet.

Have students navigate to <https://makecode.microbit.org/> or open the micro:bit app.

### Students

Turn on your device and log in.

Navigate to <https://makecode.microbit.org/> or open the micro:bit app.





## Step 2

Show the Guided Materials and videos for this activity on screen or have students follow the guided instructions online in the Student Module.

Instructions for this coding activity are available as:

- Step-by-step instructions in the Student Module
- A video walkthrough in the Student Module
- A .pdf that can be printed

Complete the coding activity using the guided instructions found on the pdfs or the video walkthroughs and instructions online in the Student Module.

The completed code for this task should look something like this:



## Step 3

Before distributing the micro:bits to the students, review the **micro:bit Student Safety Guide with the students**.

Have the students initialize the micro:bits by plugging them into a computer using the USB cable and following the directions on the micro:bit LED screen. If students are unsure of what to do, see **Step 2: Calibrate It** in the **micro:bit Quick Start Instructions**.

Have students save and upload their code to the micro:bits by following the guided instructions or video walkthroughs online in the Student Module.

## Step 4

If students have done this task quickly, encourage them to try the **Coding Challenges** for Minds-On 1 found online in the Challenges section of the Student Module.

## Minds-On 1.4: Extensions

### Additional Activities

- See the **Minds-On 1 Student Module** for other coding activities which apply the computational practices and concepts learned in this lesson.



- Students can do additional reading about life aboard the ISS (see the Online Resources section).
- Students can code a heartbeat simulator using Scratch which also uses block coding.
- Students can calculate amount of blood per day, per year pumped by the heart for an average heart rate. Students could then create a calculator for this using MakeCode or Scratch.

## Inquiry Questions

- Why would the astronauts' heart rates need monitoring?
- Under what circumstances might an astronaut's heart rate be higher or lower than normal?
- What causes the sound of a heart beat?
- How much blood does an adult pump through the heart with each beat?
- Why does blood need to be circulated throughout the body?
- Why is heart rate used to monitor individuals' health?

## Minds-On 1.5: Additional Resources

### Background Information

- [The International Space Station](#) (CurioCity Backgrounder)
- [Human Needs in Space](#) (CurioCity Backgrounder)
- [Inside the International Space Station](#) (CurioCity video)

### Online Resources

- [www.asc-csa.gc.ca/eng/search/images/watch.asp?id=7993&search=ISS](http://www.asc-csa.gc.ca/eng/search/images/watch.asp?id=7993&search=ISS) (Accessed July 3, 2018)  
Did you know that November 20 is the 'birthday' of the International Space Station? November 20, 2018 is the 20<sup>th</sup> anniversary of the ISS.
- [www.asc-csa.gc.ca/eng/astronauts/living-in-space/default.asp](http://www.asc-csa.gc.ca/eng/astronauts/living-in-space/default.asp) (Accessed July 3, 2018)  
This section of the Canadian Space Agency website includes links to information about living in space, including eating, sleeping, relaxing and exercising.
- [www.asc-csa.gc.ca/eng/missions/expedition58-59/default.asp](http://www.asc-csa.gc.ca/eng/missions/expedition58-59/default.asp) Accessed July 3, 2018)  
This section of the Canadian Space Agency website has detailed information about David Saint-Jacques' 2018-2019 mission.
- [www.nasa.gov/mission\\_pages/station/main/index.html](http://www.nasa.gov/mission_pages/station/main/index.html) (Accessed July 3, 2018)  
Keep up with all the latest activities onboard the ISS by visiting NASA's International Space Station home page.



- [https://blogs.nasa.gov/ISS\\_Science\\_Blog/2016/05/04/studying-cardiovascular-health-in-microgravity/](https://blogs.nasa.gov/ISS_Science_Blog/2016/05/04/studying-cardiovascular-health-in-microgravity/) (Accessed July 3, 2018)  
This article, part of NASA's *A Lab Aloft*, discusses various studies that seek to understand the cardiovascular health of astronauts on orbit, and the effects of spaceflight on the cardiovascular system once astronauts return to Earth.
- <http://www.asc-csa.gc.ca/eng/iss/how-to-see-the-space-station.asp> (Accessed July 3, 2018)  
Did you know that you can see the International Space Station in the night sky as it passes over your area at a distance of approximately 400 km from Earth? This page on the Canadian Space Agency website has a list of websites and applications that can help you track the Station or catch a glimpse of it.
- <https://www.google.com/streetview/#international-space-station/https://www.google.com/streetview/#international-space-station/> (Accessed July 3, 2018)  
This Google Street view gives you a 360° view of inside the ISS, just like what an astronaut on board would see!

