

Radi-N2 & You

Instructional Design - At a Glance



Overview

RADI-N2 & You gives educators and students an opportunity to monitor neutron radiation levels in their classroom and compare their results to those of David Saint-Jacques on board the International Space Station and with researchers at the Sudbury Neutrino Observatory deep underground.

Suggested Timing: 4 - 6 class periods (will depend on how many lessons are used)

Context

One of the experiments that CSA astronaut David Saint-Jacques will be responsible for during ISS Expedition 58/59 is RaDI-N2, which will measure astronauts' exposure to potentially dangerous neutron radiation in preparation for manned deep-space missions. He will be continuing research done on the ISS by CSA astronauts Robert Thirsk and Chris Hadfield, using bubble detectors manufactured by Bubble Technology Industries, based in Chalk River, Ontario, to measure neutron radiation on board the ISS.

Subjects/Skills

- **Topics Focus:** Space Science, Senior Biology, Senior Physics, Mathematics
- **21st Century Skills Focus:** Critical Thinking, Communication, Collaboration
- **Digital Literacy Focus:** Working with data, using digital data management systems, using digital forms

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 space radiation on human health.

Learning Goals

- Identify Canadian contributions to current space research
- Investigate the sources of neutron radiation, how it interacts with matter, and its potential impact on human space travel
- Develop digital literacy skills by using a variety of online and digital tools

Learning Activities

- Learn about David Saint-Jacques and his 2018-2019 mission to the ISS
- Gather information about neutron radiation
- Use specialized equipment (Bubble Tube) correctly and safely
- Create and use hand-on scientific models to understand the processes of neutron interactions with matter and neutron damage to DNA
- Collect, record, upload, download and analyze data about neutron radiation levels in the classroom, aboard the ISS and underground at SNOLAB

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Lesson #	Title	Description	Estimating Timing*
Minds-On 1	Introduction to Radi-N2 & You	Students will be introduced to the Radi-N2 & You Action Project by Canadian astronaut David Saint-Jacques. They will then obtain and summarize information about radiation as it relates to human space exploration.	40 minutes
Minds-On 2 (Optional)	Cosmic and Neutron Radiation	Senior High School Physics Students will create flow charts and physical models to understand the processes of cosmic radiation and neutron interactions with matter.	45 minutes
Minds-On 3 (Optional)	Biological Effects of Radiations	Senior High School Biology Students will explore how radiation affects the human body, specifically; they will do a quiz about the facts and fiction of the biological effects of radiation and use a physical model to explore the effects of different types of radiation on DNA.	45 minutes
Action 1	Bubble Detecting	Students will collect, record and upload data about the neutron radiation they detect in their classroom into a national dataset on CurioCity by Let's Talk Science.	20 minutes
Action 2	Neutron Radiation Data Analysis	Students will download and graph their neutron radiation data and can compare it to data from the ISS and SNOLAB (the Sudbury Neutrino Laboratory).	40 minutes
Consolidation	Implications for Earth & Space	Students will explore the implications of this project for human health on Earth and in space.	40 minutes

*Timing will vary depending on student experience and interest.

