

SESSION 5: DESIGNING YOUR EXPERIMENT

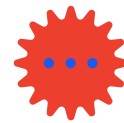
~30-45 minutes

SESSION OVERVIEW

In this session, students will take on the role of scientists by designing an experiment that could be performed at SNOLAB. Using their knowledge of underground conditions and scientific inquiry, students will develop a research question, identify important variables, make logical predictions, and highlight what information they will require to answer their question.

LEARNING GOALS

- **Develop** a SMART scientific question that can be tested with an experiment
- **Brainstorm** ideas with their peers
- **Use** the steps of the scientific method to **design** an experiment
- **Communicate** their ideas clearly using proper scientific vocabulary
- **Present** their experiment using the provided graphic organizer



Design



Communicate

SCIENTIFIC BACKGROUND

Scientists use inquiry, evidence, and careful planning to investigate questions about the world around them. Designing a successful experiment requires identifying variables, making predictions, and considering how experimental conditions influence results. Students will apply these skills to create an investigation inspired by the unique environment at SNOLAB.

CURRICULUM CONNECTIONS

Science & Technology

- Grade 4-8: A1.1 - A1.5, A3.1

Language Arts

- Grade 4-8: A1.2, A3.1, B1.1 - B1.3, D1.4, D2.1

SESSION 5: DESIGNING YOUR EXPERIMENT

~30-45 minutes

MATERIALS

- Session 5 presentation
- Laptop
- SMART board or projector
- Submission form (online or printed)
- Brainstorming worksheet

DISCUSSION PROMPTS

Before

- What makes a good scientific question?
- What questions do you have about science using a unique condition at SNOLAB that could be tested?
- What challenges might you need to consider for your underground experiment?

During

- What is your experiment trying to discover or understand?
- What are the variables in your investigation? What are you controlling?
- What evidence would you need to collect to answer your scientific question?

After

- What makes your experiment a good fit for SNOLAB?
- What was the most important decision you made when designing your experiment?
- How did your understanding of SNOLAB's unique conditions change your design?

EXTENSIONS & ASSESSMENT

Extension

- No extensions are required for this session. Students may continue to refine their experiment ideas and proposals based on feedback and further discussion

Assessment

- Student experiment submissions will be reviewed based on their ability to develop a scientific question, apply knowledge of SNOLAB's unique conditions, and communicating their experimental design

See the appendix for more details on this section



SUBMISSION REQUIREMENTS

WHAT WE ARE LOOKING FOR

Criterion	What SNOLAB is looking for
Quality of the question (SMART)	The experiment is based on a clear, specific, measurable, achievable, relevant, and testable scientific question.
Scientific thinking	The submission demonstrates logical reasoning, identifies variables where appropriate, and shows an understanding of the scientific method.
Use of SNOLAB's unique conditions	The experiment incorporates one or more of SNOLAB's unique conditions (e.g. reduced cosmic radiation, increased pressure, ultra pure water, etc.).
Creativity	The experiment presents an original or engaging idea while remaining scientifically appropriate.
Feasibility	The experiment can realistically be completed within the available time, space, equipment, cost, and program constraints.
Safety	The experiment can be conducted safely using appropriate materials, equipment, and procedures at SNOLAB and/or in the classroom.

REVIEW PROCESS

Upon receipt by SNOLAB, student experiment submissions will be reviewed by the Education & Outreach team to identify ideas that demonstrate curiosity, scientific thinking, and potential for investigation. Submissions do not need to be perfect or fully developed; scientists will work with students to refine their ideas, address challenges, and further develop their experiments. The review process is intended to support students in experiencing the true nature of the scientific method, where real-life ideas are discussed, reviewed, and edited to be more clear and achievable.

EXAMPLE SUBMISSION: GRADES 4-6

ORIGINAL SUBMISSION

Experiment name: The SNOLAB expert **Grade level:** 6

Question: Does deep underground air pressure (simulated by a syringe) squash the air bubbles inside a soft object?

Hypothesis: Since SNOLAB is 2 km underground where the air is heavier, if I simulate that pressure using the syringe, then the soft object will shrivel up.

What information is needed:

- Measure the soft object with a ruler before and after
- Record "starting volume" and "compressed volume" of air
- What do you notice about the marshmallow's shape under pressure?

Cost: Syringe: \$6.62

Marshmallows: \$2.77

Student submissions are reviewed by SNOLAB scientists and feedback is provided to help solidify their idea!

This experiment was adapted to be done underground instead of simulated in a syringe!



FINAL RESULTS



The **height and diameter of 10 marshmallows** were measured on surface and underground at SNOLAB.

They found that the **increased pressure** underground **reduced** the overall size of the marshmallows.



EXAMPLE SUBMISSION: GRADES 7-8

ORIGINAL SUBMISSION

Experiment name: WIB (Will It Bounce) **Grade level:** 7

Question: How does a basketball bounce on surface compared to underground?

Hypothesis: We think that the ball will bounce lower underground.

What information is needed:

-How high the basketball bounces

Materials: -Basketball

-Pressure sensor

-Ball pump

-Tape measure

-Slow motion camera

The question does not have to be complicated, as long as it is well thought out and testable, it will be considered.

This experiment compared how underground conditions affect the properties of a common object.



FINAL RESULTS



The basketball was pumped and **dropped from the same height** on surface and underground.

They found that the basketball **bounced lower underground** because the pump could not inflate the ball as much with the **higher pressure**.





SESSION 5

- Experiment ideas brainstorming worksheet

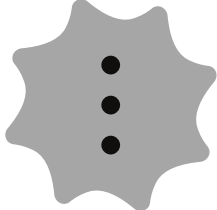




EXPERIMENT IDEAS BRAINSTORMING!

Name: _____

Grade: _____



Things I'm curious about

How I might test it

Questions I have

Drawings of my ideas