



SESSION 1: THE SCIENTIFIC METHOD

~45 - 60 minutes

SESSION OVERVIEW

In this session, students are introduced to the scientific method and examine how scientists use it to investigate questions about the world. Through observation and investigation, they learn why each step is important for real-life scientific inquiries. Lastly, students will put their knowledge to the test by conducting simple and engaging scientific activities.

LEARNING GOALS

- **Identify** and describe the steps of the scientific method
- **Explain** why each step of the scientific method is important
- **Ask** questions about science and make logical predictions
- **Investigate** simple experiments using the scientific method
- **Observe** scientific phenomena and to make conclusions
- **Share** findings using appropriate scientific vocabulary



Investigate



Observe

SCIENTIFIC BACKGROUND

The scientific method is a six-step process that serves as the basis for all scientific inquiries. It uses a structure that involves asking questions, making predictions, performing tests, recording observations, analysing data, and communicating results. Scientists at SNOLAB use these same principles to answer some of the world's most mysterious questions. As a result, the scientific method is a vital part of science education for students of all ages.

CURRICULUM CONNECTIONS

Science & Technology

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

Language Arts

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

Mathematics

- Grade 4: E2.2 & Grade 5-6: E2.1

*The Arts

- Grade 4-8: D2.1, D2.3, D3.1

* Indicates an extension activity connection



SESSION 1: THE SCIENTIFIC METHOD

~45 - 60 minutes

MATERIALS

- Session 1 presentation
- Introduction survey link
- Student tech (for survey)
- 1 clear container filled with water
- 1 wood pencil
- Raisins
- Carbonated (soda) water
- Laptop
- SMART board or projector

DISCUSSION PROMPTS

Before

- What predictions or questions can we make about this activity?
- What might happen if we drop this pencil in the bucket of water? Why?
- Do you think the carbonated water will make the raisins float or sink? Why?

During

- What do you notice about the pencil in the water?
- What happened to the raisins in the carbonated water?
- Why do we need to repeat the test at least 3 times?

After

- How did what you observe compare to your hypothesis (prediction)? Why or why not?
- Is the experiment a fail if your hypothesis was wrong? Explain.
- What other liquids do you think a pencil/raisin would float in?

EXTENSIONS & ASSESSMENT

STEM focused: Mystery box challenge

- Students investigate and make predictions about what is in a mystery box

Cross-curricular: Picture detectives (Art)

- Students use the scientific method to observe a SNOLAB experiment picture

Assessment: Session 1 Exit ticket

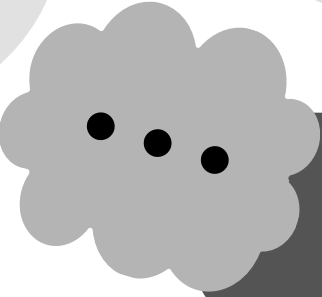
See the appendix for more details on this section



SESSION 1

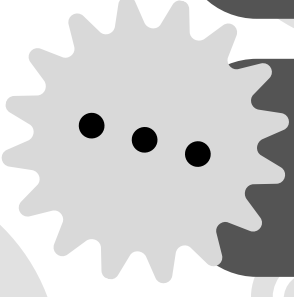
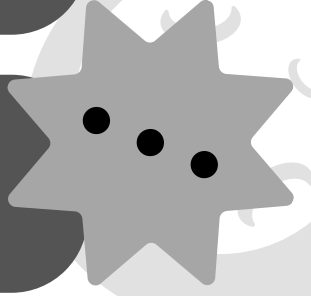
- Printable classroom poster - Scientific Method
- The Scientific Method Exit Ticket (Grade 4 - 6)
- The Scientific Method Exit Ticket (Grade 7 - 8)
- The Scientific Method Worksheet Answer Keys
- Extension Activity: Mystery box challenge (optional)
- Extension Activity: Picture detectives (optional)

THE SCIENTIFIC METHOD



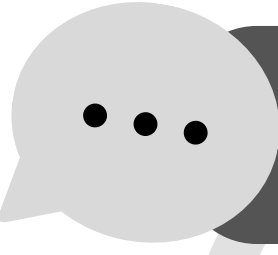
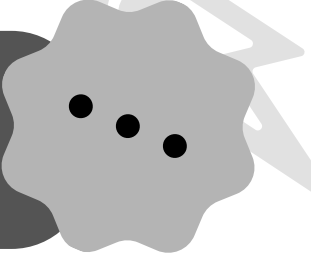
Step 1: Ask a question

Step 2: Make a prediction



Step 3: Test the prediction

Step 4: Look at the results



Step 5: Share your results





THE SCIENTIFIC METHOD

Name: _____

1

Put the steps of the scientific method in order from 1 to 5

Share your results _____
Ask a question _____
Test the prediction _____
Make a prediction _____
Look at the results _____

2

Match the step with the correct example

Will raisins float in carbonated water?

I think the raisins will float will in carbonated water.

Drop raisins in water and watch for 10-15 seconds.

The raisins floated in the carbonated water.

They floated because the bubbles lifted them.

Test the prediction

Ask a question

Make a prediction

Share your results

Look at the results

3

A student wants to find out if ice cubes will melt faster in cold or warm water.

a) What is a question they could ask?

b) What prediction could they make?



THE SCIENTIFIC METHOD

Name: _____

1

A group of students is wondering whether listening to slow music affects how quickly they can complete a puzzle. Complete the five steps of the scientific method for this investigation.

Ask a question: _____

Make a prediction: _____

Test your prediction: _____

Look at your results: _____

Share the results: _____

2

If a scientist makes a prediction that turns out to be wrong, does that mean their experiment failed? Explain your answer.



THE SCIENTIFIC METHOD

Name: Total: 14 points

1

Put the steps of the scientific method in order from 1 to 5

Share your results	<u>5</u>
Ask a question	<u>1</u>
Test the prediction	<u>3</u>
Make a prediction	<u>2</u>
Look at the results	<u>4</u>

5 points

2

Match the step with the correct example

5 points

Will raisins float in carbonated water?	Test the prediction
I think the raisins will float will in carbonated water.	Ask a question
Drop raisins in water and watch for 10-15 seconds.	Make a prediction
The raisins floated in the carbonated water.	Share your results
They floated because the bubbles lifted them.	Look at the results

3

A student wants to find out if ice cubes will melt faster in cold or warm water.

a) What is a question they could ask?

Answers may vary. EXAMPLE: Does water temperature
affect how fast an ice cube melts?

b) What prediction could they make?

Answers may vary. EXAMPLE: I think the ice cube in
the warm water will melt faster.

4 points (2 each)



Name: Total: 13 points

THE SCIENTIFIC METHOD

1

A group of students is wondering whether listening to slow music affects how quickly they can complete a puzzle. Complete the five steps of the scientific method for this investigation.

Ask a question: Answers may vary. EXAMPLE: Does listening to slow music affect how fast someone can solve a puzzle?

Make a prediction: Answers may vary. EXAMPLE: I think that it will take more time to solve the puzzle when listening to music.

Test your prediction: Answers may vary. EXAMPLE: Use a timer to see how long it takes multiple people to solve the same puzzle.

Look at your results: Answers may vary. EXAMPLE: The people who listened to music were slower at solving the puzzle.

Share the results: Answers may vary. EXAMPLE: Listening to music slowed them down because the brain relaxes too much.

10 points (2 each)

2

If a scientist makes a prediction that turns out to be wrong, does that mean their experiment failed? Explain your answer.

No, it does not mean their experiment failed because the results they obtained were still valid. The results just proved that what they predicted was incorrect, so they have learned something new regardless.

3 points



MYSTERY BOX CHALLENGE

MATERIALS

- Opaque containers or boxes with lids (enough for groups 3-5 students)
- A variety of small items to place inside (paper clips, marbles, etc.)
- Writing utensils
- "What's in the box?" worksheet
- Optional: Two-pan balances, measuring tapes/rulers, magnets

INSTRUCTIONS

1. Divide students into groups of 3 - 5 students (smaller groups is better)
2. Provide each group with a sealed mystery box or container. Students are not allowed to open the container or box until they are told to do so (at the end of the activity)
3. Instruct students that their goal is to figure out what is inside the box using only observations and evidence
4. Allow students to investigate the box's contents using different methods like shaking it, tilting it, feeling its weight, and comparing it to other boxes
5. Ask students to record their observations on their worksheet before making any conclusions
6. Have students discuss within their group what they think is inside the box and form an initial hypothesis
7. Allow students to test their hypothesis by performing additional observations (i.e. comparing movement between boxes or retesting sounds and weights)
8. Give groups time to revise their hypotheses if new evidence changes their thinking
9. Once groups are confident in their conclusion, have them share what they think is in the box and explain what evidence led them to make that conclusion
10. Reveal the contents of each box and compare results to student predictions

DISCUSSION QUESTIONS

- What observations helped you make your predictions?
- Did your hypothesis change as you gathered more evidence?
- What strategies did your group use to gather better evidence?
- What does this activity tell us about how scientists work when they cannot directly see what they're studying?
- How did the scientific method help you throughout this activity?

CURRICULUM CONNECTIONS

- Language Arts: A1.2, A3.1, B1.1, B1.2
- Science & Technology: A1.1 - A1.5



WHAT'S IN THE BOX?

Name: _____

1

Examine your box without opening it and record your observations in the space below.

2

Using your observations, what do you think is in the box?

3

What tests did you perform to test your prediction?

4

Did your prediction change after doing tests? If yes, write it below.

5

Was your prediction right? What was in the box?



PICTURE DETECTIVES

MATERIALS

- A SNOLAB image from their website (showing an experiment, part of the underground lab, etc.)
- Projector or SMART board (to display the image for students to view)
- Picture detectives worksheet
- Writing utensils
- Chart paper or whiteboard (for whole-group discussion)

INSTRUCTIONS

1. Briefly discuss with students that scientists are always observing their surroundings and that for them to answer the world's questions, they first need to collect evidence. End this brief discussion with a review of observation versus inference and provide them with a simple example (i.e. an observation is that there are tracks on the ground; an inference is that something moved across the surface)
2. Display the chosen SNOLAB image for 30-60 seconds
3. Ask students to observe silently and carefully. Encourage them to look for objects, patterns, colours, shapes, anything unusual, and/or movement.
4. Remove or hide the image when time is up
5. Give students a few minutes to independently record their observations on the worksheet provided
6. When students are finished, invite them to share their observations and inferences
7. On the board/chart paper, record students' observations, questions, and inferences
8. Discuss whether each idea is an observation or an inference
9. Put the image back on the screen and give students time to observe it a second time
10. Ask students to compare their new observations to their notes and discuss what was similar and different

DISCUSSION QUESTIONS

- What was easier: making observations or making inferences?
- Did everyone notice the same details?
- Why is it important to separate observations from inferences?
- What additional information helped you better understand the image?
- How did this activity relate to the scientific method? What steps were used?

CURRICULUM CONNECTIONS

- Language Arts: A1.2, A3.1, B1.1, B1.2
- Science & Technology: A1.1 - A1.5
- The Arts: D2.1, D2.3, D3.1



PICTURE DETECTIVES

Name: _____

1 Record your initial observations in the space below.

2 What questions do you have about the picture?

3 What inferences can you make about the picture?

4 Record any new observations in the space below.