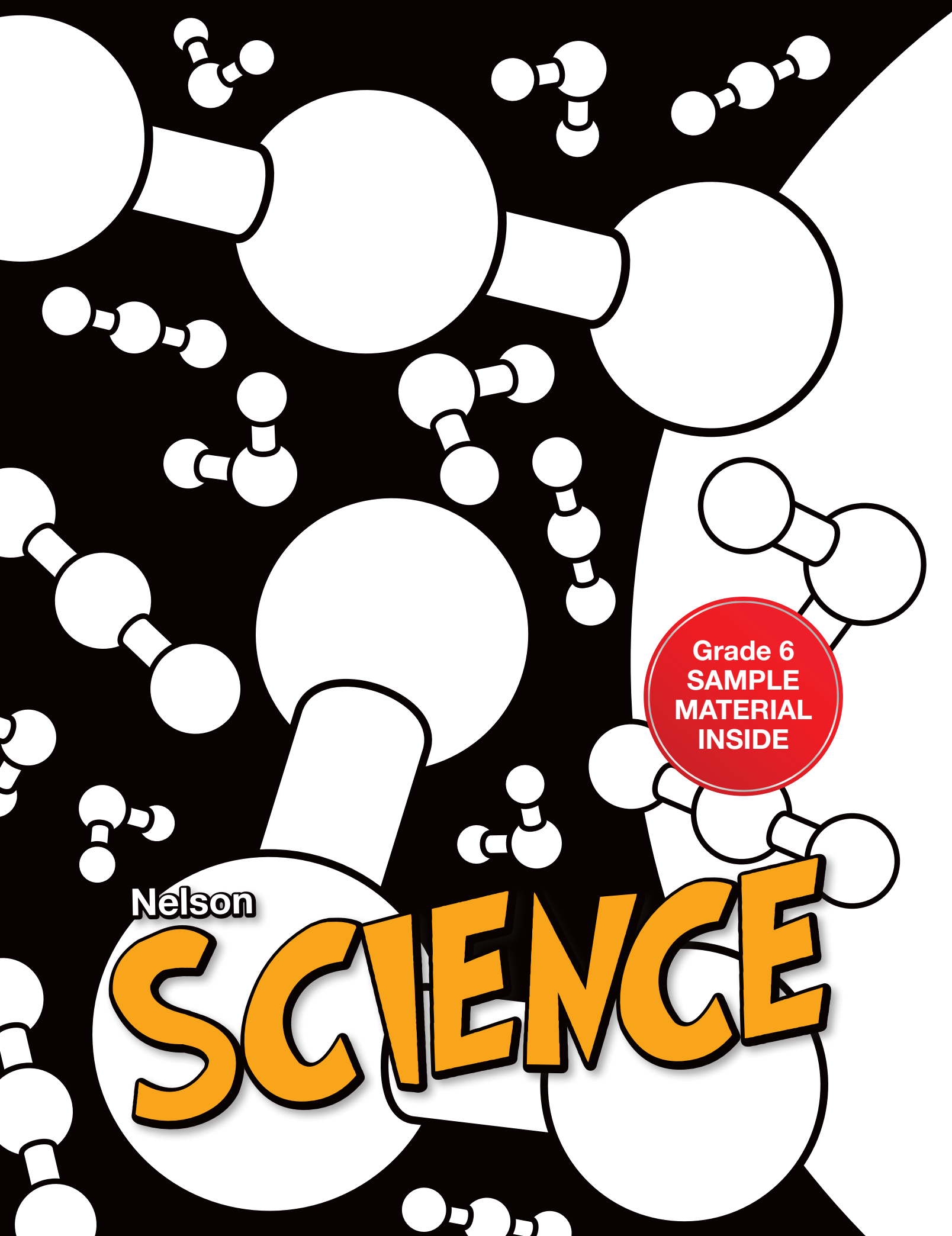


Nelson

SCIENCE

About Nelson Science

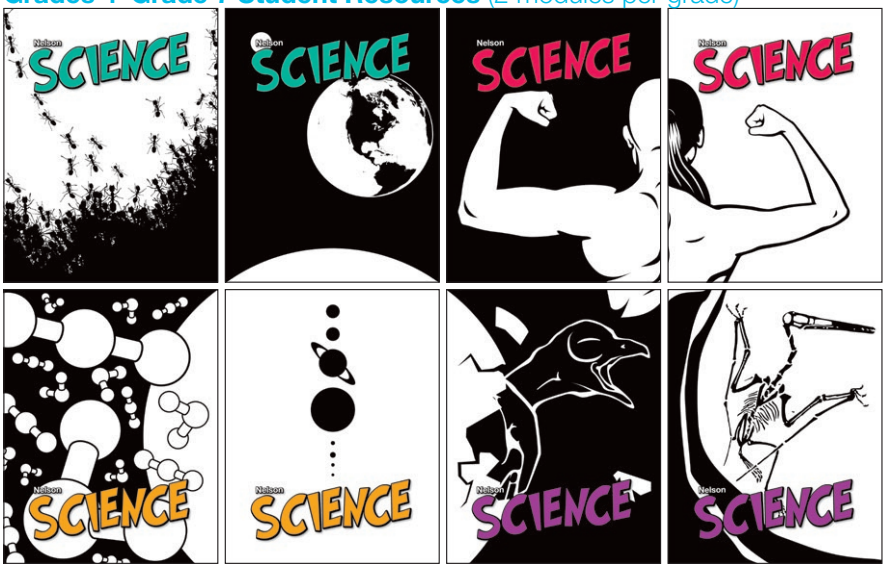
Developed by an experienced team of BC educators, *Nelson Science* is a comprehensive series built from the ground up to fully align with the new BC Science curriculum. Student resources feature activities designed to unleash students' innate curiosity. Infused with First Peoples knowledge and perspectives, and grounded in student-driven scientific inquiry, these resources open inquiry pathways that allow students to deepen their understanding of Big Ideas, develop Core and Curricular Competencies, and build place-based and content knowledge.

Key Features

- Focused on the doing of science—explorations and investigations are designed to develop the skills, processes, and habits of mind of scientific inquiry
- First Peoples scientific knowledge and perspectives are woven into activities through authentic contexts designed to support learning from First Peoples
- Design-focused activities allow students and teachers to cover all *Learning Standards* from the Applied Design, Skills, and Technologies (ADST) curriculum
- A suite of custom-developed, modifiable assessment tools, provide support for formative assessment of core and curricular competencies, as well as content knowledge

Kindergarten–Grade 3 Teacher's Resources

Grades 4–Grade 7 Student Resources (2 modules per grade)



Resource Component Overview

For Students

Kindergarten–Grade 3

Activity Cards

- 9 double-sided, laminated Activity Cards featuring a unique activity on each side (total of 18 activities) to address all 4 strands: Biology, Chemistry, Physics, Earth/Space Science
- 8 copies of each Activity Card (total of 72 cards)
- Packaged in a durable cardboard box

Grades 4–7

Student Resource

- Flexible modular format—2 print modules per grade
- Each module contains 2 strands:
  - Biology and Chemistry
  - Physics and Earth/Space Science
- Online access to the Science Skills Toolkit

Online Student Centre (sold separately)*

- Each Online Student Centre provides:
  - 1 eBook containing 2 strands (includes audio read-aloud for struggling readers)
  - Science Skills Toolkit to support curricular competencies

***Contact your Sales Representative for more information.**

For Teachers

Kindergarten–Grade 3

Teacher's Resource

(includes Online Teaching Centre)

- Print Teacher's Resource with facilitation strategies and assessment support

Teacher Cards

- 5 double-sided, laminated cards to support place-based activities

Online Teaching Centre

(included with Teacher's Resource)

- Teacher's Resource eBook
- Image bank containing art and photos from the Activity Cards in JPG format
- Science Skills Toolkit with teaching notes to support curricular competencies
- Modifiable Blackline Masters (includes assessment tools)
- Interactive Whiteboard lessons for all 4 strands
- Videos with teaching notes
- Cross-curricular Connections with teaching notes
- Literature Connections with teaching notes
- Weblinks
- RSS feeds

Grades 4–7

Teacher's Resource

(includes Online Teaching Centre)

- Flexible modular format—2 print Teacher's Resource modules per grade
- Each module contains 2 strands:
  - Biology and Chemistry
  - Physics and Earth/Space Science

Online Teaching Centre

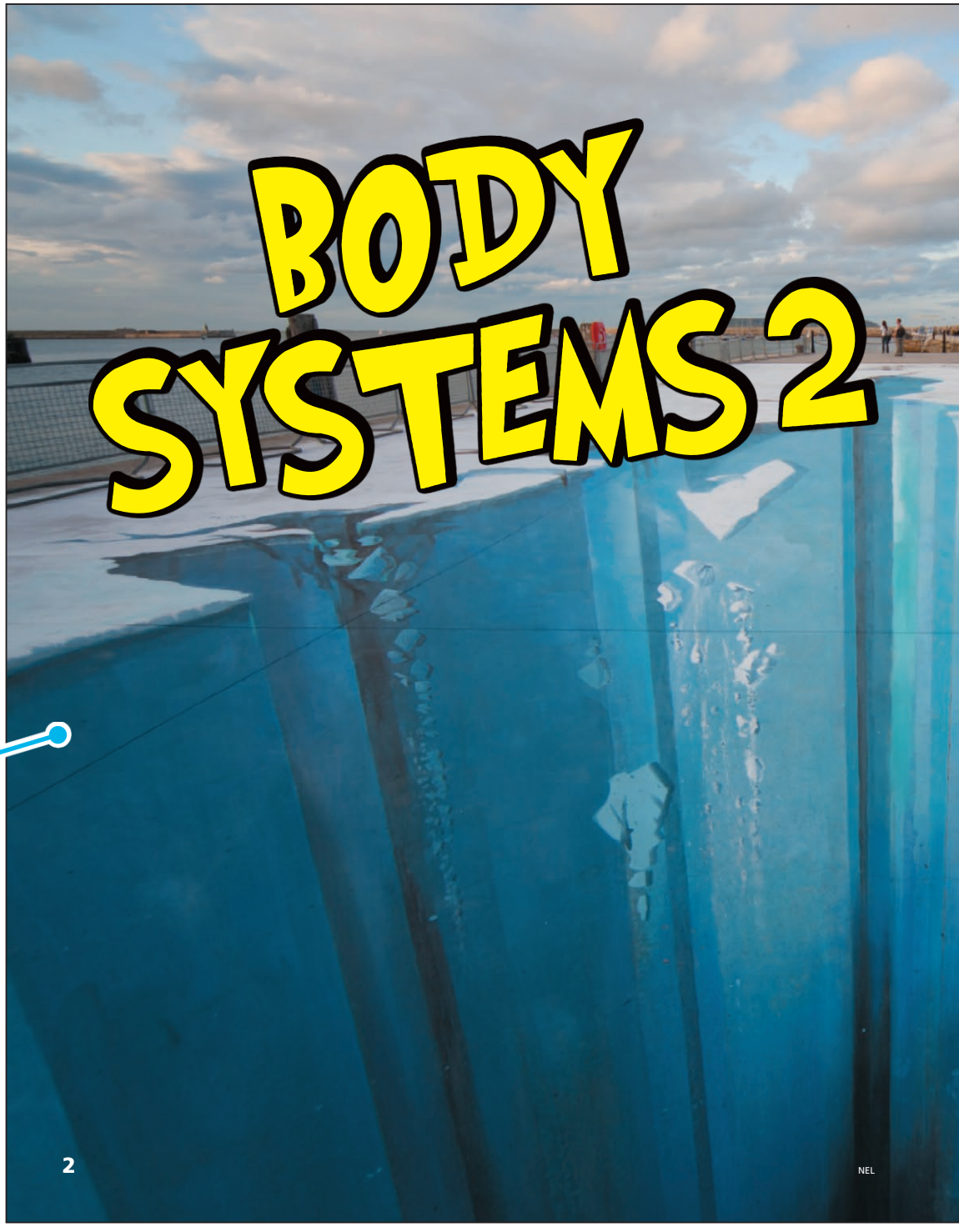
(included with Teacher's Resource)

- Teacher's Resource eBook containing 2 strands
- Image bank containing art and photos from the Student Resource in JPG format
- Science Skills Toolkit with teaching notes to support curricular competencies
- Modifiable Blackline Masters (includes assessment tools)
- Animations with teaching notes
- Videos with teaching notes
- Literature Connections with teaching notes
- Weblinks
- RSS feeds

Nelson SCIENCE

Student Resource

Unit Opening Provocation



The opening image is visually engaging and is connected to the unit content or the curricular provocation.

Nelson SCIENCE

Can You Be Tricked?

Look at the image carefully. Discuss how you or others might react if you were walking down the street and saw this.

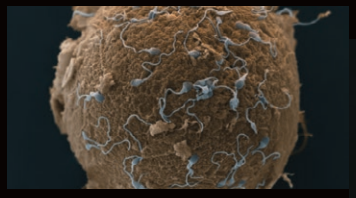
The unit opening activity is always a curricular provocation. The high-interest activity is intended to engage students and elicit their naturalistic questions about the conceptual content of the unit.

Nelson SCIENCE

Student Resource

Explore!

Explore!, located after the unit opening provocation, provides a visual overview of the key topics in a unit. It replaces traditional tables of contents and supports more nonlinear, curiosity-driven approaches to the exploration of the science concepts in a unit.



Nelson SCIENCE

Student Resource
Exploration

Place-based activities provide opportunities to do science outside the classroom and are identified with a tree icon.

Try This! activities are structured activities that provide students with opportunities to develop science skills and conceptual understandings by doing science.

Captions are informative and can include questions and/or activity suggestions that can serve as entry points into the science content and springboards for inquiry.

High-impact images directly relate to key concepts and provide some of the content of the lesson. These images offer opportunities for differentiated instruction and to show rather than tell students about the concepts.

MEMORY AND LEARNING

Many cultures, communities, and families share memories by telling stories. **Q:** What stories do you remember from your family or community? Who can you share them with? Does everyone remember the stories in the same way?

TRY THIS! Find Your Tree

In this activity, you will perform a simple outdoor activity using your memory. You will be led to a tree blindfolded. You will use your senses to explore the tree. Then you will use your memory to find the same tree without the blindfold.

1. Take one minute to silently observe and connect with the place where you are.
2. Observe your surroundings. Decide what observations you will need to make in order to find your tree.
3. When it is your turn, you will be blindfolded. A classmate will carefully lead you to a tree or to another natural object.
4. Use your memory to remember how many steps it takes to get to the tree. Use your senses to explore the tree.
5. Now your classmate will take you back to where you started and take off your blindfold. Use your memory to find your tree!
6. Discuss your processes with classmates. What was easy to remember? What was difficult?
7. Reflect on your experience. How do you feel about your place now that you have experienced it in a new way?

18

In the fall, a chickadee stores each seed in a different spot. Its brain grows to help it remember where thousands of hidden seeds are. **Q:** How does the chickadee's memory help it to survive?

Explorations present conceptual content. They often include one or more hands-on *Try This!* activities.

IN THE BRAIN

Small narrative passages, often featuring local contexts, are written in student-friendly language and provide essential knowledge through engaging real-world contexts.

Memory is the ability to store and remember information and experiences.

Your short-term memory only lasts a few seconds. Your long-term memory lasts for weeks or years. Your brain stores important information in your long-term memory.

Q: Test your memory. How many numbers can you remember at the same time? How can you make sure that you remember a number tomorrow?

Memory helps us to learn things. **Learning** happens slowly, as you gain knowledge or skill. During learning, your brain adds information to your long-term memory. It also makes connections between different memories. What kind of activities help you to learn?

Questions throughout the narrative help students make connections, check their understanding, or extend their thinking.

In response to experience and learning, your brain changes. The more often you do something, the stronger those connections in the brain become. Q: Why is practice important when learning a new skill such as riding a bike?

Student Resource

Conduct an Inquiry!

Conduct an Inquiry! sections are full scientific inquiries. Students set their own specific question and decide how they will plan and conduct their investigation.

Conduct an Inquiry! uses the headings for scientific inquiry from the BC curriculum and prompts students through the inquiry stages.

Conduct an Inquiry!

HOW CAN WE

You will plan an experiment to test your partner's ability to memorize something. When memorizing, it helps to use more than one of your five main senses. It also helps to picture things in your head.

Question and Predict

What questions do you have about memory and ways to memorize things? Choose an interesting and testable question. For example, you can ask your partner to try to memorize something in two different ways, and see which way works best. Make a prediction.

Plan and Conduct

Plan an investigation to test your partner's memory. Make sure your experiment is a fair test. What variable will be changed and what variable will be measured? What data will you collect?

Carry out your experiment and record data.

TEST MEMORY?

Process and Analyze

Construct a table or graph to show patterns in data. Compare the data with your prediction and explain your results.

Evaluate

Was your investigation a fair test? What were some possible sources of error? How could you improve your experiment?

What are some social implications from what your results show about memory? What evidence do you have to support your opinion?

Apply and Innovate

Use your findings to design a method that you and your partner will use to improve your memory. Try it for at least a week and then report your results.

Communicate

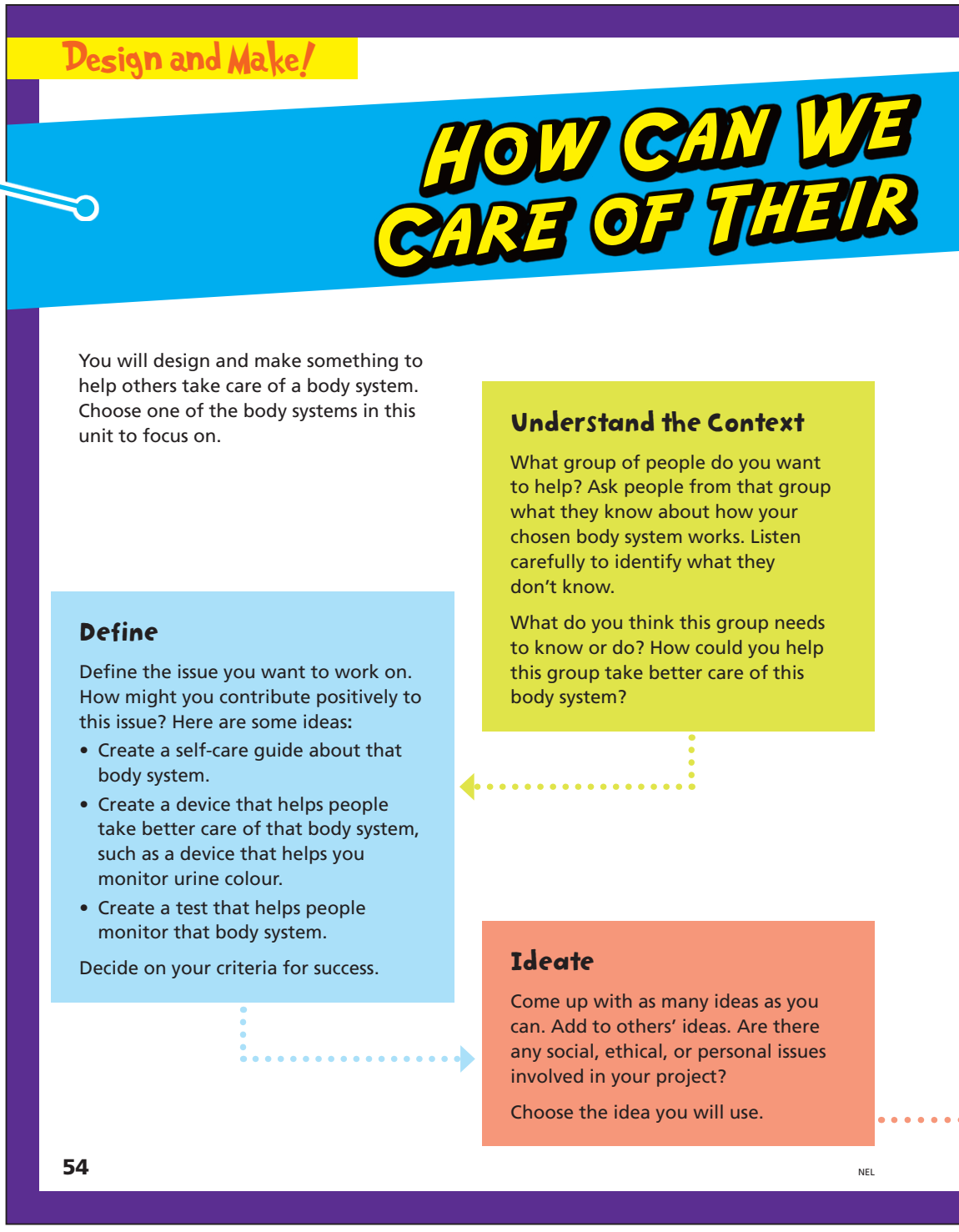
Explain what you learned about memory and ways to memorize from your inquiry.

The *Scientific Inquiry Toolkit*, available online, supports the development of the procedural knowledge of scientific inquiry.

Student Resource

Design and Make!

There is one *Design and Make!* activity in each unit that supports implementation of the BC Applied Design, Skills, and Technologies (ADST) curriculum and allows students to develop their design thinking in relation to science topics. These open-ended design activities invite students to come up with their own design ideas and choose one to act on.



Help Others Take Body Systems?

Prototype

Identify some sources of information that you could use.

Make a plan. What materials and technologies will you use for your prototype? Do you need to learn new technologies or skills? Are there safety issues?

Create your prototype.

Test

Test your prototype with people from the group you want to help. Ask for feedback. Consider the feedback. Make and record changes.

Make

Plan your final product. What materials and technologies will you use?

Make your product. Use materials in a way that minimizes waste.

Share

Decide how you will share your product with the group of people you want to help. Do it.

Demonstrate your product and explain your design process. How well does it meet your criteria for success? What evidence do you have that it helped people?

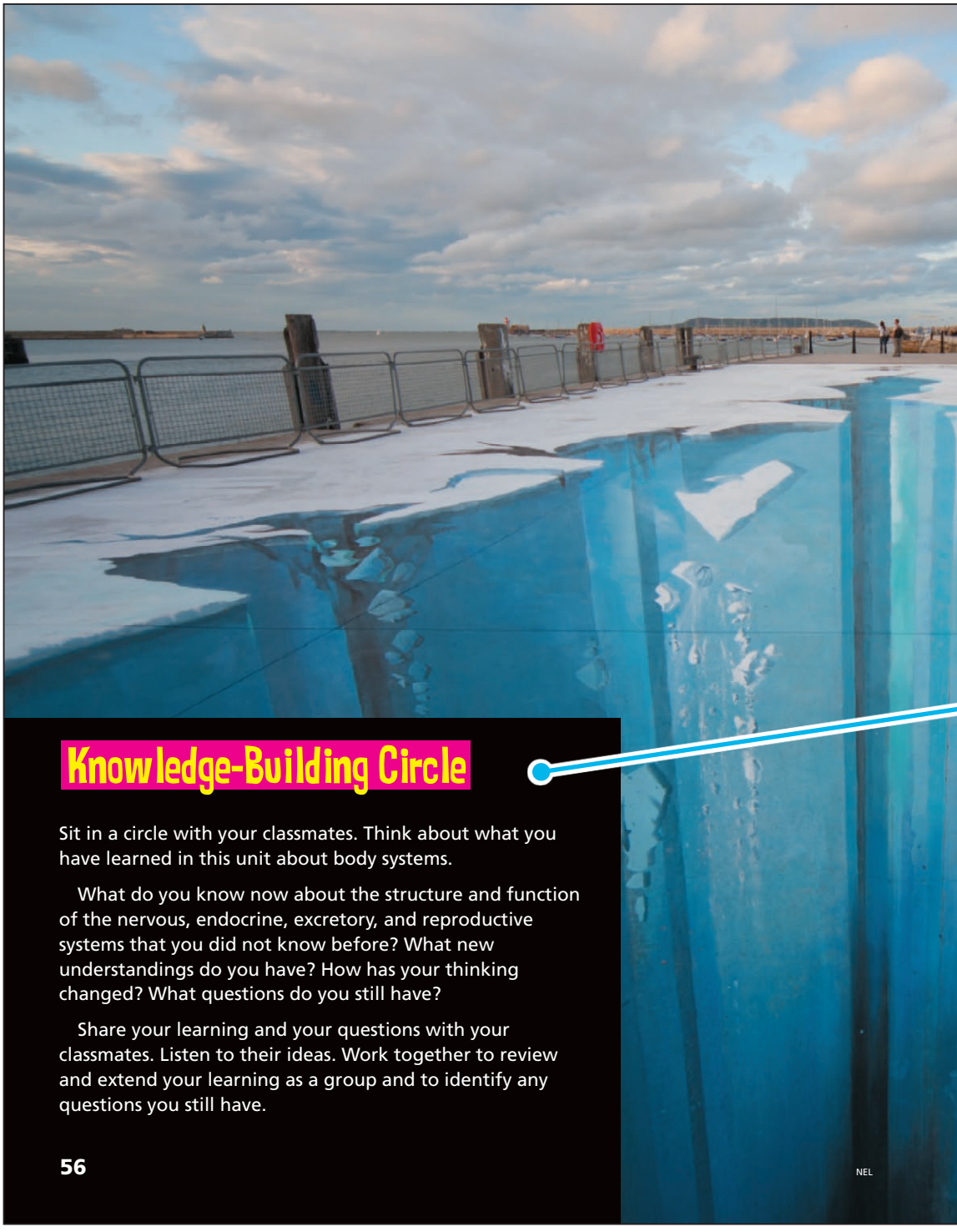
What new design issues have you identified?

Design and Make! activities in the Student Resource use the headings for the design process from the ADST curriculum and prompt students through the design stages.

The *Design Toolkit*, available online, provides additional support for the skills and processes of design.

Student Resource

Unit Closing Activity



Knowledge-Building Circle

Sit in a circle with your classmates. Think about what you have learned in this unit about body systems.

What do you know now about the structure and function of the nervous, endocrine, excretory, and reproductive systems that you did not know before? What new understandings do you have? How has your thinking changed? What questions do you still have?

Share your learning and your questions with your classmates. Listen to their ideas. Work together to review and extend your learning as a group and to identify any questions you still have.

The closing activity in each unit is one of three types:
Knowledge-Building Circle: Students come together in a circle to pose questions and revisit, refine, and consolidate their ideas. The circle promotes a non-hierarchical approach, encourages attentive listening, and models effective First Peoples traditions of oral sharing.
Applications and Innovations: Students work individually or in small groups as part of a whole-class jigsaw activity to identify real-world applications and innovations, locally and globally, which are based on what they learned in the unit, and present the results in a manner of their choosing.
Take Action!: Students apply what they learned to come up with a personal or collaborative project to support the well-being of self, family, the community, or the land. The activity encourages deeper understanding and promotes learning from First Peoples.

Teacher's Resource

Inquiring into...

Inquiring into Body Systems 2

Resources Available in the Online Teaching Centre

Family Letter
Optical Illusions

In this unit, students will use the skills, processes, and habits of mind of scientific inquiry to explore how body systems help an organism to survive. They learn that each body system is made up of organs. Each organ performs its own role and works with the other organs to contribute to maintaining a healthy body system. Students learn that each body system works independently and interdependently with the other systems to form a functioning body. Students come to understand that if an organ does not work properly, the body system it is associated with becomes unbalanced, creating an imbalance in other body systems, too, and impacting the organism's ability to interact and survive in its environment. If this is the first unit of the school year, you may wish to distribute **Family Letter**.

Blackline Master

Developing the Big Idea and Unifying Concepts identifies and explains the big idea and the unifying concepts that are addressed in the unit.

Developing the Big Idea and Unifying Concepts

The Big Idea for this unit is that **multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment**. As students investigate the nervous, endocrine, reproductive, and excretory body systems, they develop an understanding of what a body system is and how it works, and how its function relates to the proper functioning of each organ in the body system.

The unifying concept for this unit is **systems**. Students will mainly focus on how a system is made up of many parts, or organs. Each part performs its function and interacts with other parts to keep the system functioning properly. Students develop an understanding that if a part does not function, it affects the entire system. Students also learn that smaller systems exist that interconnect to support the function of a larger system. In addition, each body system interconnects to support the entire body.

As students explore each body system, they will be able to add to their previous understanding of body systems from Grade 5.

The image on the unit opening pages is an optical illusion of a crevasse, painted on a sidewalk. Here, the artist has used forced perspective and shading to create the impression of depth to trick our eyes.

Multi-Year Classrooms highlights areas of potential combined instruction based on the content and big idea of the unit.

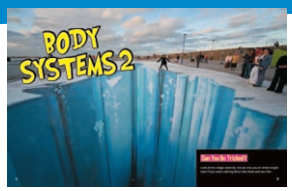
Multi-Year Classrooms

In Grade 5, students learned how the musculoskeletal, digestive, respiratory, and circulatory systems help organisms survive in their environment. In Grade 6, students continue learning about body systems by exploring the nervous, endocrine, reproductive, and excretory systems.

The content in this unit builds on the Grade 5 Big Idea that **multicellular organisms have organ systems that enable them to survive and interact with their environment** and, to a lesser extent, to the Grade 4 Big Idea that **living things sense and respond to their environment**. Now students learn how organisms' body systems, such as the nervous, endocrine,

This section provides teachers with a general overview of the unit. This section also notes any scientific descriptions and explanations that have recently been improved as new evidence became available.

STUDENT RESOURCE PAGES 2–3



reproductive, and excretory systems, help them to interact, reproduce, and survive in their environment. In Grade 7, students will learn how environmental pressures result in the evolution of diverse species and the diversity of body systems.

Using This Provocation

Using This Provocation supports the opening activity in the Student Resource.

This Provocation activity invites students to **demonstrate a sustained curiosity about a scientific topic or problem of personal interest** related to body systems. The activity is intended as a naturalistic way for students to **identify questions to answer or problems to solve through scientific inquiry** as they progress through this unit.

Science Background

Science Background provides a detailed overview of the science concepts covered in a given activity and, where applicable, addresses possible misconceptions.

Our eyes gather and transmit an enormous amount of information to our brain. In order to process all of that information, the brain uses shortcuts to interpret what we see and make sense of the world around us. Usually, these judgments are close enough to reality that we can respond appropriately.

Optical illusions occur when our brain misinterprets information. Optical illusions can use colour, shading, patterns, and perspective to trick our brain into seeing things that are not real.

Observing and Supporting Learning

- Give students plenty of time to explore the optical illusion, and to talk with each other. Students may try observing the image with one eye or at different distances.
- Students may be interested in looking for more optical illusions online, or trying to create their own. Consider providing additional examples by distributing **Optical Illusions**.

Blackline Master

Formative Assessment	
Collecting Information	**Using Information**
Listen for evidence of curiosity about the brain as students examine the optical illusions.	Provide descriptive feedback to acknowledge curiosity and encourage students to sustain it. For example, *You tried many different optical illusions; I could tell you were really curious about how they work. As we go through the unit, let me know if I can help you find additional sources of information.*
Listen for questions, or statements that can be turned into questions. Record and use these for further student-driven inquiry opportunities throughout the unit.	Provide whole-class feedback on the questions you heard: *Here are some of the questions I heard you asking. Did I miss any?*

Teacher's Resource

Exploration

Curricular and Core Competencies identifies the curricular competencies (scientific skills and processes and habits of mind) that students will be using to build their science knowledge and any core competencies that they will have significant opportunities to develop.

The *Focus Question* identifies a key question that is derived from the learning standards for content knowledge.

Learning from First Peoples links authentic First Peoples perspectives and scientific knowledge about the natural world to the skills and concepts in a given activity.

Memory and Learning in the Brain

You Will Need

per student or group:
- (optional) camera or video camera

Resources Available in the Online Teaching Centre

Try This! Find Your Tree
Field Guide Entry
Place-Based Learning Reflection
Scientific Inquiry Report
Scientific Inquiry Scale
Documenting Learning: Memory and Learning in the Brain
Documenting Communication: Profiles
Documenting Communication: Facets
Self-Assessment: Comm... Facets
Self-Ass... Communication: Prompts
Scientific Inquiry Toolkit (observe, plan data collection, observe, measure, communicate findings and ideas, reflect on place)

Using This Exploration

Curricular and Core Competencies: In the outdoor Try This! activity, students will **experience and interpret the local environment**. They will **make observations in familiar or unfamiliar contexts** to **choose appropriate data to collect** and **observe and measure data** in order to find "their" tree when blindfolded. Students will **communicate their processes**, and will be asked to **express and reflect on personal or shared experiences of place** that resulted from the activity.

Students will be developing the core competencies of **Communication (facet: explain/recount and reflect)** as they communicate their processes and how the activity contributed to their personal or shared experiences of place.

Focus Question: How do memory and learning work together to help organisms survive and interact with their environment?

Big Idea and Unifying Concepts: This Exploration develops students' understanding of the complexities of memory and learning in the brain. Each has a very important role in helping organisms interact with and survive in their environment. Thus, an understanding of memory and learning in the brain supports the development of the Big Idea that **multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment**. The complexity of the nervous system is further highlighted as students examine the brain. The brain itself acts as a system within the nervous system. This concept of systems nested within other systems supports the unifying concept of **system**.

Learning from First Peoples: Giving students plenty of time to memorize their tree in the Try This! activity supports the First Peoples concepts of experiential learning and the role of memory in learning. In addition, connecting with place and remembering the characteristics of local plants/trees is an integral part of the First Peoples way of knowing and living in the community.

Memory is an important concept in traditional First Peoples ways of learning, because learning is often passed on orally, through stories told by one generation to the next. Lessons, values, ways of being, and knowledge of the land and place are taught through the repetition of stories. The power of the story is considered to be integral to learning. Remembering and reciting are important facets of learning through storytelling.

Science Background

Memory is one of the most important of all mental abilities. Without memory, learning is impossible. The brain is capable of extraordinary memorization of both events and conceptual information.

(continued)

STUDENT RESOURCE PAGES 18–19

Your brain processes information and stores memories in a multi-step process. Sensory input is remembered by the brain and placed in short-term memory. Short-term memories typically last from 10 to 15 seconds and represent information being momentarily retained and processed. Short-term memory capacity is limited to roughly four to nine items at a time.

Short-term memories can be consolidated into long-term memories. Long-term memories can be maintained for very long periods of time, and there seems to be almost unlimited capacity for memory storage; while some people have much better memories than others, our brains do not become "full."

Possible Misconceptions

Students may confuse learning and memory, or believe that the two are the same thing. However, although the two are strongly linked, they are not the same thing. Memory is the storage of information in the brain, while learning is the *process* of acquiring stored information or skill. Of course, without memory, most kinds of learning would be impossible. Another way to think of it is that a memory happens right away, while learning takes time to achieve.

Learning from the Land

As students use their senses and memories to observe and learn about how they can use memory to learn to find something again in the natural environment, they come to realize that all organisms must learn and remember details of their environments in order to survive.

Learning from the Land provides teaching strategies and prompts when place-based learning opportunities arise.

Observing and Supporting Learning

- Consider using **Documenting Learning: Memory and Learning in the Brain** to document your observations of student learning as students respond to the images and text and do the hands-on activity in this Exploration. — Assessment Tool
- Observe students as they work on the Try This! activity and highlight relevant sections of the **Scientific Inquiry Scale**. This outdoor activity helps students acquire **place-based** knowledge and experience. — Blackline Master
- Some students may wish to complete **Field Guide Entry** and include it in their science logs, portfolios, or field guides. — Goals; Blackline Master
- You may wish to hand out **Try This! Find Your Tree** to provide students with a copy of the activity to use outdoors. — Blackline Master

Nelson SCIENCE

Teacher's Resource

Exploration

Try This! provides facilitation strategies for these hands-on activities in the Student Resource, including notes about materials, safety precautions, and sample responses.

TRY THIS! Find Your Tree

Purpose

To observe a tree while blindfolded, and then use the brain's memory to find that tree again.

A Note about Safety

- Be aware of student allergies before taking the class outside. Familiarize yourself with any poisonous plants that may be in your area.
- Make sure the activity area is free of poison ivy, holes, big rocks, uneven ground, or other tripping hazards. Outline the boundaries of the activity area. Students in wheelchairs can perform the activity on a flat surface, such as a cemented play area.
- Remind students to be safe and to show concern for the safety of others.

Notes

- Before starting, ask students to consider any social, ethical, or environmental implications of the activity.
- Emphasize a focus on *place* during this activity. Encourage students to use tactile clues to help their memory.
- Students will experience the natural world with different senses than that of sight. As a result, they may discover details of trees that they might otherwise have overlooked.
- The focus of the activity is on memory and on the different ways we keep track of information.
- For this activity to work, there should be more than one tree in the area.
- If necessary, suggest that students increase the complexity of the activity by having the blindfolded students turn around a couple of times, or leading them on an indirect path to the tree. However, students who use their memory of the path and direction to find the tree rather than their memory of the tree itself are still achieving the purpose of the activity.
- Consider inviting a First Peoples Knowledge Keeper to join the class for this activity.
- Look for opportunities to incorporate teachings about the local environment into the activity. For example, challenge students to describe how other organisms (e.g., birds, raccoons, insects) use memory in the same environment, and what details might be important to them to remember.

Sample Responses

6. For example, it was easy to remember how big the tree felt around, but the texture of the tree and its smell were difficult to remember.

7. For example, I felt more connected to this place, and especially this one tree, after I had observed it so closely.

Blackline Master

- While students are still outdoors or upon returning indoors, invite them to answer the questions on **Place-Based Learning Reflection** and to include the reflection in their science logs, portfolios, or field guides.

Blackline Master

- Consider having students use **Scientific Inquiry Report** to record their observations and analysis and to include the completed report in their science log or portfolio.

Communication

Assessment Tool

- Consider using **Documenting Communication: Profiles** (or **Facets**) to document examples of student development.

Formative Assessment

Collecting Information	Using Information
Observe the extent to which students are experiencing and interpreting the local environment to make observations they think they will need to identify their tree.	Provide students with descriptive feedback on their observations; for example, *I heard you say you observed a hollow that you were going to use to know where you were in relation to the tree. I heard you say that you saw that some of the trees had rough bark, and some smooth, so you would have to feel the texture of the tree you were led to in order to find it again.*

Formative Assessment supports teachers with assessment strategies for observing students, adjusting instruction, and providing descriptive feedback.

Formative Assessment

Collecting Information	Using Information
Observe whether students are able to observe, measure, and record relevant data in detail.	Provide students with descriptive feedback. For example, *I see you made a list of your observations in order. I noticed you made a table to record the observations you made using different senses. I noticed you recorded the number of steps.*
Observe the extent to which students are able to express and reflect on their experiences of place.	If students have difficulty getting started, adjust instruction by having them answer the questions on **Place-Based Learning Reflection**.
Observe the extent to which students use their communication skills as they communicate their processes and describe how the activity contributed to their personal or shared experiences of place.	Consider providing descriptive feedback using the language of the **Communication Competency Profiles**. For example, *You can answer questions about your activities. You can recount experiences and activities and tell something you learned. You can recount and comment on experiences. You share your ideas and try to connect them with others' ideas.*

- Students may wish to document this activity as an example of their **Communication** competency in Science, and complete a self-assessment using **Self-Assessment: Communication: Facets** (or **Prompts**).
- This Exploration is an excellent opportunity to discuss learning strategies and to encourage students to try out new ones. There are many learning strategies, such as repeating information, using mnemonics, using visualization, or categorizing new information into chunks.

Communication
Assessment Tool

SAMPLE RESPONSES

Q: What stories do you remember from your family or community? Who can you share them with? Does everyone remember the stories in the same way?

R: I remember the stories of my family's celebrations in their home country. I can share these stories with friends and my teachers. Some people remember the stories in a different way. They disagree about some details like when it happened or who said what.

Q: How does the chickadee's memory help it to survive?

R: Chickadees need the seeds they stored to survive during the winter. Their memory helps them remember where they hid their food, so they can eat.

Q: Test your memory. How many numbers can you remember at the same time? How can you make sure that you remember a number tomorrow?

R: For example, I can keep four numbers in my head at the same time. To remember a number tomorrow, I can repeat the number many times while doing jumping jacks. Or, I can visualize the number as a picture in my head.

Q: Why is practice important when learning a new skill such as riding a bike?

R: Doing the same thing again and again makes the new connections in your brain stronger, so you learn better.

Identifying Inquiry Opportunities

Ask students to consider the types of procedures they might conduct to test the effects of different learning strategies on a person's long-term memory. Remind them to consider their ethical responsibilities when deciding how to conduct an experiment of this nature. Students can identify variables and possible sources of error.

Teacher's Resource

Conduct an Inquiry!

You Will Need is a list of materials teachers will need for any activities in the section.

Online Teaching Centre Resources is a list of resources in the Online Teaching Centre that can be used to support the Exploration, such as Blackline Masters, Assessment Tools, and the Science Skills Toolkit.

Conduct an Inquiry! How Can We Test Memory?

You Will Need

per student/group:
- materials of choice (e.g., picture books or magazines for participants to memorize images or text from; recorded music, discussions, or sounds for students to memorize)
- (optional) camera or video camera

Resources Available in the Online Teaching Centre

Scientific Inquiry Report
Scientific Inquiry Process
Two-Column Chart
Scientific Inquiry Scale
Scientific Inquiry Self-Assessment Scale
Documenting Learning: How Can We Test Memory?
Documenting Communication: Profiles
Documenting Communication: Facets
Self-Assessment: Communication: Facets
Self-Assessment: Communication: Prompts
Documenting Critical Thinking: Profiles
Documenting Critical Thinking: Facets
Self-Assessment: Critical Thinking: Facets
Self-Assessment: Critical Thinking: Prompts
Documenting Personal Awareness and Responsibility: Profiles
Documenting Personal Awareness and Responsibility: Facets
Self-Assessment: Personal Awareness and Responsibility: Facets
Self-Assessment: Personal Awareness and Responsibility: Prompts
Scientific Inquiry Toolkit (identify testable questions, predict, plan procedures, identify and control variables, plan data collection, observe, measure, record, compile and display data, identify patterns, draw conclusions, evaluate procedures, identify possible sources of error, identify implications, evaluate information, identify applications, act on new ideas and questions, collaborate, communicate findings and ideas)

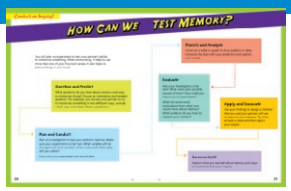
Using This Inquiry

Curricular and Core Competencies: In this inquiry, students are invited to **demonstrate a sustained curiosity about a scientific topic or problem of personal interest** as they test their own memories and develop a method to improve them. Students will **identify a question to answer through scientific inquiry,** and **make predictions about the findings of their inquiry**. They will **plan an appropriate investigation to answer their question, decide which variable should be changed and measured for a fair test**, and **choose appropriate data to collect to answer their questions**. Students will **observe, measure, and record data, using appropriate tools, possibly including digital technologies, construct a table or graphs, as appropriate, to represent patterns or relationships in data, identify patterns and connections in their data**, and **demonstrate an understanding and appreciation of evidence** as they **compare data with predictions and develop explanations for results**. They will be asked to **evaluate whether their investigations were fair tests, identify possible sources of error,** and **suggest improvements to their investigation methods**. Students will **identify some of the social implications of the findings from their own investigations**. They will then **transfer and apply their learning to co-operatively design** a method for improving their own memories, and test it for a week to **contribute to care for self through personal or collaborative approaches**. Students will **communicate their ideas, explanations, and processes in a variety of ways**.

Students will be developing the core competency of **Communication (facet: collaborate)** as they work with a partner to develop an investigation into memory and use their findings to develop a way to improve their own memories, and (**facet: explain/recount and reflect**) as they communicate their findings from their investigation and their subsequent attempt to improve their own memories. They will be developing the core competency of **Critical Thinking (facet: question and investigate)** as they conduct their inquiry and **(facet: develop and design)** as they develop a method to improve their own memories. They will be developing the core competency of **Personal Awareness and Responsibility (facet: self-determination, well-being)** as they develop and use their own method to improve their memories.

Big Idea and Unifying Concepts: This inquiry helps to develop the understanding that learning and memory can be enhanced. Improving our memory gives us access to more information that can be stored for a longer time. This can increase our chances to survive in and interact with our environment. Thus, this inquiry supports the Big Idea that **multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment**.

STUDENT RESOURCE PAGES 20–21



Science Background

Many factors and cognitive devices influence how well we are able to memorize and recall information. They include the following:

- Repetition: Repeating a name or number or a task helps store that information or ability into memory.
- Association: Adding or grouping pieces of information can improve memory.
- Vocalization: Saying a name or number or describing a task out loud can enhance memory.
- Mnemonics: Mnemonics are memory devices such as musical rhythms and letter and word associations used as memory devices. For example, children often learn the letters of the alphabet by singing the alphabet song.
- Sleep: Sleeping allows your brain to process long-term memories.
- Reducing stress: Stress reduces the ability to remember information.
- Exercise and a healthy diet: Not surprisingly, exercise and proper nutrition improve brain health and memory.
- Paying attention to detail: Being consciously attentive to details can improve overall information retention.
- Playing mentally challenging activities: Performing mental games such as crosswords and jigsaw puzzles, or learning how to play an instrument help maintain brain health and memory.

Observing and Supporting Learning

- This inquiry is an opportunity for students to develop **procedural knowledge** in Science as they use all the stages of scientific inquiry to investigate memory. They develop their **scientific literacy** by using the skills and processes of science to build knowledge about memory and the brain.
- Consider handing out **Scientific Inquiry Process**. Review the process of scientific inquiry if necessary. Remind students that support for the skills listed is available in the **Scientific Inquiry Toolkit**. If there are particular skills you want students to focus on in this inquiry, ask them to highlight those skills.
- Consider asking students to use **Scientific Inquiry Report** to record their work and to include the completed report in their science log or portfolio.
- Be sensitive regarding students who experience learning disabilities, who may have a greater-than-average difficulty with memorizing certain things or memorizing in certain ways (e.g., memorizing text, or memorizing from hearing words). Consider encouraging students to work with their partner to choose a method of memorizing that the partner already feels confident with.
- In Question and Predict, students can start by brainstorming different ways of memorizing information. For example, a student might ask, *Can movement help a student to remember a five-digit number better? I predict that if the student jumps up and down while repeating a number out loud three*

Goals

Blackline Master

Blackline Master

Teacher's Resource

Conduct an Inquiry!

times, she will be able to remember that number better five minutes later than if she repeats a different five-digit number three times without jumping. Other questions may include: *Do people remember black and white images or colour images more accurately? Does a memory trick such as using flash cards really help people to memorize more key words? How does listening to music affect memory?*

- In Plan and Conduct, allow students to choose their own memory test, but remind them that some memory tests may not be appropriate for the classroom.
- Ask students to consider any social and ethical implications of their memory test on others before proceeding. The consideration of social and ethical implications is an important **habit of mind** in science.

Goals

- If necessary, review what a fair test is, and remind students to change only one variable in their test.

Formative Assessment

Collecting Information	Using Information
Listen for whether students can identify a question about memory to answer through scientific inquiry.	If students have difficulty identifying a question to answer, adjust instruction by facilitating a class discussion about memory to help them generate ideas for questions. Topics of discussion could include different factors that can affect memory or how memory differs among different groups of people.
Observe the extent to which students are able to plan an appropriate investigation to answer their question.	Provide students with descriptive feedback. For example, *You have planned to test memory using a card game. You have identified the tools and materials you will need. You have set a time limit for the test.*
Observe the extent to which students are able to identify and decide which variable should be changed and which should be measured for a fair test.	If students have difficulty deciding which variables should be changed and measured, adjust instruction by having them list all possible variables for the procedures they chose and then identify the one that will have to be changed and the one that will have to be measured to answer their question.
Observe the extent to which students can construct a table or graph to show the pattern in their data.	If significant numbers of students have difficulty constructing tables or graphs that clearly show the pattern in their data, consider adjusting instruction by asking students to give each other peer feedback about whether they can see the pattern.

- In Evaluate, possible social implications may be that some students learn better while moving their bodies or listening to music, strategies that are not always supported by classroom learning. Thus, classroom learning may favour some kinds of learning over others.
- In Apply and Innovate, students may choose a simple method of improving their memory of what they learn in class; for example, by discussing what they learned out loud for a few minutes at the end of each day.

Formative Assessment

Collecting Information	Using Information
Observe the extent to which students demonstrate an understanding and appreciation of evidence by using their findings to support their explanations.	If students do not demonstrate an understanding and appreciation of evidence when developing their explanation of results, adjust instruction by having them work in a **Two-Column Chart** with the headings "Evidence" and "Explanation."
Observe the extent to which students can evaluate whether their investigations were fair tests.	Provide students with descriptive feedback on their evaluations of whether their investigation was a fair test. For example, *You identified that it might not have been a fair test because there were variables you did not control/because there were significant sources of error.*

Nelson SCIENCE

Formative Assessment	
Collecting Information	**Using Information**
As students evaluate their procedures, listen for evidence that they are considering possible sources of error.	As students identify possible sources of error, provide descriptive feedback. For example, *I noticed you put down users doing the same test several times, which could be a source of error. You understand that repeating a task could affect your results.*
Observe the extent to which students can suggest improvements to their investigation methods.	Provide students with descriptive feedback. For example, *I noticed you have suggested using a different pattern each time. Try it to see if it gives you better data.*
Ask questions to clarify and extend students' thinking about the social implications of the findings from their own investigations. For example, *Who do you think are better learners—students who think their memory cannot be improved or students who think they can improve their memory? What would happen to a person who lost the ability to remember things?*	If students have difficulty with these questions, consider adjusting instruction by having a class discussion or inviting a community expert to discuss the social implications of differing attitudes and abilities with memory.
Observe the extent to which students can transfer and apply their learning to design a method to improve their memories.	If students have difficulty designing a method to improve memory based on their own findings, initiate a class discussion about all groups' findings to generate a class list of possibilities for students to choose from. Students may wish to reorganize into different pairs or groups based on the method they are interested in investigating.

- Consider using **Documenting Learning: How Can We Test Memory?** to document your observations of students' scientific inquiry skills and processes as they do this investigation.
- Observe students as they work and highlight relevant sections of the **Scientific Inquiry Scale**.
- If you wish to observe with a core competency focus, consider observing for **Communication**, **Critical Thinking**, or **Personal Awareness and Responsibility**.

Assessment Tool

Assessment Tool

Communication
Critical Thinking
Personal Awareness and Responsibility

Custom-developed, modifiable assessment tools support formative assessment of core and curricular competencies, as well as content knowledge.

Formative Assessment	
Collecting Information	**Using Information**
Observe the extent to which students use their critical thinking skills as they conduct their inquiry, and as they develop and design a method to improve their own memories.	Consider providing descriptive feedback using the language of the **Critical Thinking Competency Profiles**. For example, *You can ask questions, make predictions, and gather information. You can use what you learn. You can experiment purposefully to develop options. You can gather and combine new evidence with what you already know to develop plans.*
Observe the extent to which students exercise self-determination for their own well-being as they develop their own method to improve their memories.	Consider providing descriptive feedback using the language of the **Personal Awareness and Responsibility Competency Profiles**. For example, *You can make decisions about your activities. You can celebrate your efforts. You can connect your actions with positive consequences. You can set realistic goals and use strategies to accomplish them.*

- Ask students to highlight applicable "I can" statements on the **Scientific Inquiry Self-Assessment Scale**. If some students have difficulty self-assessing accurately, conference with them individually.
- Some students may wish to document this activity as an example of their **Communication**, **Critical Thinking**, or **Personal Awareness and Responsibility** competencies in Science and complete a self-assessment.

Blackline Master

Communication
Critical Thinking
Personal Awareness and Responsibility
Assessment Tool

Colour-coded icons, shown at point-of-use, act as identifiers for coverage of curricular goals, and core and curricular competencies.

Identifying Inquiry Opportunities

Students may be interested in investigating whether all students can improve their memory using the same memory trick or technique. Have students design an inquiry to answer their question.

Teacher's Resource

Design and Make!

Big Ideas and Unifying Concepts identifies how the doing and knowing of science can roll up toward the big idea and goals of the science curriculum.

Design and Make! How Can We Help Others Take Care of Their Body Systems?

Resources Available in the Online Teaching Centre

- Design Log
- Design Process
- Design and Make! Share Stage
- Design Scale
- Design Self-Assessment Scale
- Documenting Learning: How Can We Help Others Take Care of Their Body Systems?
- Documenting Communication: Profiles
- Documenting Communication: Facets
- Self-Assessment: Communication: Facets
- Self-Assessment: Communication: Prompts
- Documenting Creative Thinking: Profiles
- Documenting Creative Thinking: Facets
- Self-Assessment: Creative Thinking: Facets
- Self-Assessment: Creative Thinking: Prompts
- Documenting Critical Thinking: Profiles
- Documenting Critical Thinking: Facets
- Self-Assessment: Critical Thinking: Facets
- Self-Assessment: Critical Thinking: Prompts
- Documenting Social Responsibility: Profiles
- Documenting Social Responsibility: Facets
- Self-Assessment: Social Responsibility: Facets
- Self-Assessment Social Responsibility: Prompts
- Design Toolkit

Blackline Master

Blackline Master

Assessment Tool

Creative Thinking

Social Responsibility

Communication

Critical Thinking

Using This Design and Make!

Curricular and Core Competencies: In this Design and Make! activity, students will be using all the curricular competencies related to the stages of design in the Applied Design, Skills, and Technologies curriculum, as well as the four curricular competencies under Applying and Innovating in the Science curriculum.

Students will be developing the core competencies of **Communication (facet: collaborate), Creative Thinking (all facets), Critical Thinking (facet: develop and design)**, and **Social Responsibility (facets: contributing to community, building relationships)** as they design a way to help others take care of a body system.

Big Idea and Unifying Concepts: As students consider how to help others learn to take care of their body systems, they further develop their own understanding of the Big Idea that **multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment** and of the unifying concept of **systems**. This Design and Make! also supports the Big Ideas that **design can be responsive to identified needs, complex tasks require the acquisition of additional skills, and complex tasks may require multiple tools and technologies**.

Science Background

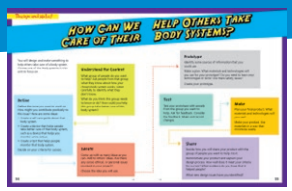
Maintaining good health requires a multifaceted approach. Eating properly, exercising, sleeping, and preventing chemical and physical damage are important for all body systems.

Any health concern should be addressed by seeking advice from a medical expert.

Observing and Supporting Learning

- Consider handing out **Design Process**. Review the stages of design, if necessary. Remind students that support for each stage of the design process is available in the **Design Toolkit**. The Toolkit also provides tips for teachers.
- Consider asking students to use **Design Log** to record their design process. Their record can include notes, photographs, or other formats.
- Consider using **Documenting Learning: How Can We Help Others Take Care of Their Body Systems?** to document your observations.
- If you wish to observe with a focus on core competencies, consider a focus on **Creative Thinking** or **Social Responsibility**. (Note that you could also focus on **Communication** or **Critical Thinking**, but those competencies are frequently addressed elsewhere in this unit.)

STUDENT RESOURCE PAGES 54–55



- In Understand Context, ask students to use local experts and website resources to find out more about common issues with keeping body systems healthy.
- In Define, students determine what problem they want to work on and how they might contribute positively. If students come up with an idea for a technological device that is beyond their scope, they can still create a prototype on paper using written descriptions and/or diagrams.
- For Ideate, encourage students to generate novel and creative approaches for dealing with keeping a body system healthy. Remind students to consider social and ethical issues (a **habit of mind** of science) and to be sensitive when discussing other people's health.
- For Prototype, students are expected to identify and use sources of information. Encourage students to do research from reliable sources. Consider asking students to develop a list of local experts such as First Peoples Elders or Knowledge Keepers, doctors, nurses, and nutritionists.
- In Test, students are expected to test out the effectiveness of their plan with some members of the group they want to help. It is important that students also seek feedback from knowledgeable experts so that they use the most recent and reliable evidence for keeping the body system healthy. The plan should be approved by you, possibly in collaboration with a knowledgeable expert, before it is carried out.
- In Make, students carry out their plan. Encourage students to use materials in ways that minimize waste.
- For Share, students decide how they will share their product with the group they want to help. Then ask them to demonstrate their product and describe their design process. Consider using the question prompts in **Design and Make! Share Stage**.
- Ask students whether they want to use this design activity as an example of their **Communication, Creative Thinking, Critical Thinking,** or **Social Responsibility** competency and complete a self-assessment.
- Ask students to highlight applicable "I can" statements on the **Design Self-Assessment Scale**. If some students have difficulty self-assessing accurately, conference with them individually.

Goals

Blackline Master

Communication
Creative Thinking
Critical Thinking
Social Responsibility
Assessment Tool

Formative Assessment	
Collecting Information	**Using Information**
Observe students as they work through the applied design steps.	If students are having difficulty with any of the steps in the design process, provide additional instruction based on the Tips for Teachers in the **Design Toolkit**.

Teacher's Resource

Unit Closing Activity

Knowledge-Building Circle

You Will Need

per class (optional):
- video camera

Resources Available in the Online Teaching Centre

Documenting Communication: Profiles
Documenting Communication: Facets
Self-Assessment: Communication: Facets
Self-Assessment: Communication: Prompts

Using This Closing Activity

Curricular and Core Competencies: As students participate in a knowledge-building circle to examine and improve ideas, identify any misconceptions or confusion, and elevate the understanding of the group as a whole, they will be developing their **Communication** competency (**facets: connect and engage with others** and **explain/recount and reflect**).

Big Idea and Unifying Concepts: Students have an opportunity to demonstrate their understanding of the Big Idea that **multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment** and of the unifying concept of systems.

Learning from First Peoples: Knowledge-building circles are based on sharing, relationships, and memories. Consider connecting with local First Peoples to find out how knowledge-building circles are similar to and different from cultural talking circles, and what the protocols are for talking circles.

Observing and Supporting Learning

- Invite students to come together in a knowledge-building circle to pose questions, and to revisit, refine, and consolidate their ideas. The circle promotes a non-hierarchical approach, encourages attentive listening, and models effective First Peoples traditions of oral sharing.
- The collective goal of the knowledge-building circle is idea improvement. This activity serves to identify shared problems and gaps in understanding and to advance the understanding beyond the level of the most knowledgeable individual.
- Give students time to reflect quietly as individuals before the sharing begins.
- Teachers may wish to use a talking stick or other strategy to help students take turns speaking.
- Consider reinforcing the non-hierarchical nature of the knowledge-building circle by participating in it on an equal footing with students, rather than simply watching and listening. For example, share something you learned about the nervous, endocrine, reproductive, or excretory body systems that you did not know before, or share a question you still have.
- Consider making a video recording of the knowledge-building circle so that later you and students can use excerpts as evidence of learning to communicate learning to parents in parent-teacher interviews or student-led conferences. Making a video recording eliminates your need to actively assess students' learning during the knowledge-building circle, a task that would set you outside the circle.

Observing and Supporting Learning suggests possible teaching strategies for engaging students in this activity.

STUDENT RESOURCE PAGES 56–57

- Provide students with sticky notes. When other students are sharing their knowledge, have them record an idea, a new learning, something they also learned, or a question, using point form. In their Science Journals, students can place the sticky notes in a web or mind map structure. Have them add a reason for why they wrote each note.
- If you have videotaped the session, you may wish to review it later to document your observations of student development in the core competency of **Communication** using **Documenting Communication Profiles** (or **Facets**).

Communication
Assessment Tool

- Ask students whether they want to use this closing activity as an example of their **Communication** competency in Science and complete a self-assessment using **Self-Assessment: Communication: Facets** (or **Prompts**).

Communication
Assessment Tool

Identifying Inquiry Opportunities

Consider providing time for students to plan and conduct inquiries to answer questions that remain at the end of the knowledge-building circle. Students may do research and find out that some of these questions are still being pondered and investigated. Remind students that it is the **nature of science**, as an evidence-based way of knowing the natural world, that descriptions and explanations are continually being improved.

Goals

Notes

Notes

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