hands-on
science

An Inquiry Approach

Living Things for Grades K–2

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Hands-On Science: An Inquiry Approach
Living Things for Grades K–2

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Introduction to *Hands-On Science*

About *Hands-On Science*

Hands-On Science helps develop students' scientific literacy through active inquiry, problem solving, and decision making. With each activity in *Hands-On Science*, students are encouraged to explore, investigate, and ask questions as a means of heightening their own curiosity about the world around them. Students solve problems through firsthand experiences and by observing and examining objects within their environment. In order for young students to develop scientific literacy, concrete experience is of utmost importance—in fact, it is essential.

Format of *Hands-On Science*

The redesigned Science Curriculum for British Columbia (<https://curriculum.gov.bc.ca/>) is based on a "**Know-Do-Understand**" model. The three elements—Content (Know), Curricular Competencies (Do), and Big Ideas (Understand) all work together to support deeper learning. *Hands-On Science* promotes this model through its inquiry-based, student-centred approach. As such, it is structured around the following elements.

The **Big Ideas** are broad concepts introduced in kindergarten and expanded upon in subsequent grades, fostering a deep understanding of science. The Big Ideas form the basis of the *Hands-On Science* modules to address important concepts in biology, chemistry, physics, and earth/space science.

The **Core Competencies** are embedded throughout the curriculum and throughout *Hands-On Science*. These competencies enable students to engage in deeper lifelong learning.

Core Competencies

Thinking	■ knowledge, skills, and processes that enable students to explore problems, weigh alternatives, and arrive at solutions ■ problem solving and making effective decisions, and applying them to real-world contexts
Communication	■ effectively reading, writing, speaking, listening, viewing, and representing ■ using a variety of information sources and digital tools
Personal and Social	■ relates to a student's identity as an individual and as a member of a group or community ■ contributing to the care of themselves, others, and the larger community

The **Learning Standards** are made up of **Curricular Competencies** and **Content**. **Curricular Competencies** are skills, strategies, and processes students develop as they explore science through hands-on activities. Curricular Competencies are addressed further on page 33.

The **Content** of the Science Curriculum for British Columbia and *Hands-On Science* is concept-based and relates directly to the Big Ideas. The Content relies on cross-cutting concepts developed throughout the grade levels, including:

- cause and effect
- change
- cycles
- evolution
- form and function
- interactions
- matter and energy
- order
- patterns
- systems

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The Multi-Age Approach

Hands-On Science is designed with a multi-age approach to meet the needs of students in kindergarten to grade two (K–2). Each module explores the Big Ideas, Core Competencies, and Learning Standards for K–2. This approach provides teachers and students with flexible, personalized learning opportunities.

Inquiry and Science

Throughout ***Hands-On Science***, as students explore science concepts, they are encouraged to ask questions to guide their own learning. The inquiry model is based on five components:

1. formulating questions
2. gathering and organizing information, evidence, or data
3. interpreting and analyzing information, evidence, or data
4. evaluating information, evidence, or data, and drawing conclusions
5. communicating findings

Using this model, teachers facilitate the learning, and students drive the process through inquiry. As such, the approach focuses on students' self-reflections as they ask questions, discover answers, and communicate their understanding. An inquiry approach begins with structured inquiry, moves to guided inquiry and, finally, results in open inquiry.

Structured Inquiry	■ The teacher provides the initial question and structures the procedures to answer it. ■ Students follow the given procedures and draw conclusions to answer the given question.
Guided Inquiry	■ The teacher provides the initial question. ■ Students are involved in designing ways to answer the question and communicate their findings.
Open Inquiry	■ Students formulate their own question(s), design and follow through with a developed procedure, and communicate their findings and results.

Inquiry takes time to foster and requires scaffolding from a structured approach to more open inquiry as students gain skills and experience.

In ***Hands-On Science***, the focus of most activities is on guided inquiry, as teachers pose the main question for the lesson, based on the Learning Standards. Students are involved in generating further inquiry questions to personalize learning, but will continue to benefit from guidance and support from the teacher.

> Open inquiry activities are only successful if students are motivated by intrinsic interests and if they are equipped with the skills to conduct their own research study. (Banchi and Bell, 2008)

The Goals of Science Education in British Columbia

Science plays a fundamental role in the lives of Canadians. The Science Curriculum for British Columbia (<https://curriculum.gov.bc.ca/>) states:

> Science provides opportunities for us to better understand our natural world. Through science, we ask questions and seek answers to grow our collective scientific knowledge. We continually revise and refine our knowledge as we acquire new evidence. While maintaining our respect for evidence, we are aware that our scientific knowledge is provisional and is influenced by our culture, values, and ethics. Linking traditional and contemporary First Peoples understandings and current scientific knowledge enables us to make meaningful connections to our everyday lives and the world beyond.

> The Science curriculum takes a place-based approach to science learning. Students will develop place-based knowledge about the area in which they live, learning about and building on First Peoples knowledge and other traditional knowledge of the area. This provides a basis for an intuitive relationship with and respect for the natural world; connections to their ecosystem

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and community; and a sense of relatedness that encourages lifelong harmony with nature.

The Science Curriculum for British Columbia identifies five goals that form the foundation of science education. In keeping with this focus on scientific literacy, these goals are the bases for the lessons in **Hands-On Science**. The Science Curriculum for British Columbia contributes to students' development as educated citizens through the achievement of the following goals. Students are expected to develop:

1. an understanding and appreciation of the nature of science as an evidence-based way of knowing the natural world that yields descriptions and explanations that are continually being improved within the context of our cultural values and ethics
2. place-based knowledge of the natural world and experience in the local area in which they live by accessing and building on existing understandings, including those of First Peoples
3. a solid foundation of conceptual and procedural knowledge in science that they can use to interpret the natural world and apply to new problems, issues, and events; to further learning; and to their lives
4. the habits of mind associated with science—a sustained curiosity; an appreciation for questions; an openness to new ideas and consideration of alternatives; an appreciation of evidence; an awareness of assumptions and a questioning of given information; a healthy, informed skepticism; a seeking of patterns, connections, and understanding; and a consideration of social, ethical, and environmental implications
5. a lifelong interest in science and the attitudes that will make them scientifically literate citizens who bring a scientific perspective, as appropriate, to social, moral, and ethical

decisions and actions in their own lives, culture, and the environment

Hands-On Science Principles

- Effective science education involves hands-on inquiry, problem solving, and decision making.
- The development of Big Ideas, Core Competencies, Curricular Competencies, and Content form the foundation of science education.
- Children have a natural curiosity about science and the world around them. This curiosity must be maintained, fostered, and enhanced through active learning.
- Science activities must be meaningful, worthwhile, and related to real-life experiences.
- The teacher's role is to facilitate activities and encourage critical thinking and reflection. Children learn best by doing, rather than by just listening. Instead of simply telling, the teacher, therefore, should focus on formulating and asking questions, setting the conditions for students to ask their own questions, and helping students to make sense of the events and phenomena they have experienced.
- Science should be taught in conjunction with other school subjects. Themes and topics of study should integrate ideas and skills from several core areas whenever possible.
- Science education should encompass, and draw on, a wide range of educational resources, including literature, nonfiction research material, audio-visual resources, and technology, as well as people and places in the local community.
- Science education should be infused with knowledge and worldviews of Indigenous peoples, as well as other diverse multicultural perspectives.

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- Science education should emphasize personalized learning. Personalized learning also focuses on enhancing student engagement and providing them with choices to explore and investigate ideas. Personalized learning also encompasses place-based learning, where learning focuses on the local environment.
- Science education is inclusive in nature. Learning opportunities should meet the diverse needs of all students through differentiated instruction and individualized learning experiences.
- Self-assessment is an integral part of science education. Students should be involved in reflecting on their work and setting new goals based on their reflections which, in turn, enables them to take control of their learning.
- Teacher assessment of student learning in science should be designed to focus on performance and understanding, and should be conducted through meaningful assessment techniques implemented throughout each module.

Cultural Connections

To acknowledge and celebrate the cultural diversity represented in Canadian classrooms, it is important to infuse cultural connections into classroom learning experiences. It is essential for teachers to be aware of the cultural makeup of their class and to celebrate these diverse cultures by making connections to curricular outcomes. In the same way, it is important to explore other cultures represented in the community and beyond, to encourage intercultural understanding and harmony. For example, teachers in British Columbia should make connections to the local cultural communities to highlight their contributions to the province. Throughout *Hands-On Science*, suggestions are made for connecting science topics to cultural explorations and activities.

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Indigenous Perspectives and Knowledge

Indigenous peoples are central to the Canadian context, and it is important to infuse Indigenous knowledge into the learning experiences of all students. The intentional integration of Indigenous knowledge in **Hands-On Science** helps to address the Calls to Action of the Truth and Reconciliation Commission of Canada, particularly the call to "integrate Indigenous knowledge and teaching methods into classrooms" (Action 62) and "build student capacity for intercultural understanding, empathy and mutual respect" (Action 63).

Indigenous peoples have depended on the land since time immemorial. The environment shapes the way of life: geography, vegetation, climate, and natural resources of the land determine the methods used to survive. Because they observe the land and its inhabitants, the environment teaches Indigenous peoples to survive. The land continues to shape Indigenous peoples' way of life today because of their ongoing, deep connection with the land. Cultural practices, stories, languages, and knowledge originate from the land.

The traditional territories of the First Peoples cover the entirety of what is now British Columbia. The worldviews of Indigenous peoples and their approaches and contributions to science are now being acknowledged and incorporated into science education. It is also important to recognize the diversity of Indigenous peoples in British Columbia and to focus on both the traditions and contemporary lives of the Indigenous communities in your area. Contact personnel in your school district—Indigenous consultants and/or those responsible for Indigenous education—to find out what resources (e.g., people, books, videos) are available. Many such resources are also featured in **Hands-On Science**.

NOTE: When implementing place-based learning, many opportunities abound to consider Indigenous perspectives and knowledge. Outdoor learning provides an excellent opportunity to identify the importance of place. For example, use a map of the local area to have students identify where the location is in relation to the school. This will help students develop a stronger image of their community and surrounding area.

It is also important to identify on whose traditional territory the school is located, the traditional territory of the location for the place-based learning, as well as the traditional names for both locations. The following map, "First Nations in British Columbia," from Indigenous Services Canada can be used for this purpose: <https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-BC/STAGING/texte-text/fnmp_1100100021018_eng.pdf>.

Incorporate land acknowledgment once students have learned on whose territory the school and place-based learning location are located. The following example can be used for guidance:

■ We would like to acknowledge that we are gathered today on the traditional, ancestral, and unceded territory of the _____ people.

When incorporating Indigenous perspectives, it is important to value Traditional Ecological Knowledge (TEK):

> Traditional Ecological Knowledge, or TEK, is the most popular term to denote the vast local knowledge First Peoples have about the natural world found in their traditional environment… TEK is, above all, local knowledge based in people's relationship to place. It is also holistic, not subject to the segmentation of contemporary science. Knowledge about a specific plant may include understanding its life cycle, its spiritual connections, its relationship to the seasons and with other plants and animals in its ecosystem, as well as its uses and its stories. (*Science First Peoples Teacher Resource Guide*)

Indigenous peoples developed technologies and survived on this land for millennia because of their knowledge of the land. Indigenous peoples

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used observation and experimentation to refine technologies, such as building canoes and longhouses and discovering food-preservation techniques. As such, TEK serves as an invaluable resource for students and teachers of science.

Indigenous peoples do not view their knowledges as "science" but, rather, from a more holistic perspective, as is reflected in this quote from Dr. Jolly, Cherokee, and President of the Science Museum of Minnesota:

> When I weave a basket, I talk about the different dyes and how you make them and how the Oklahoma clay that we put on our baskets doesn't permeate the cell walls, it deposits on the outside. It makes a very nice dye but if you cut through the reed you'll see white still on the inside of the reed, whereas if I make a walnut dye and if I use as my mordent, alum and I use as my acid cider, that walnut dye will permeate the cell walls. You cut through the reed and it's brown through and through. Now what I've just described is the difference between osmosis and dialysis. That Western science calls those scientific terms is really wonderful, but it's not scientific terms if you are a basket weaver. Our culture incorporates so much of what people would call scientific knowledge and ways of thinking so naturally that we haven't parsed it out and put it in a book and said this is our science knowledge versus our weaver's knowledge. When I weave a basket I also tell the stories of the spirituality and not just the ways of which I dyed it. A basket weaver is as much a scientist, as an artist, and a spiritual teacher. We'd never think that you'd separate out just the science part, but you can't weave a basket without knowing the science. (*Science First Peoples Teacher Resource Guide*)

Throughout **Hands-On Science**, there are many opportunities to incorporate culturally appropriate teaching methodologies from an Indigenous worldview. First Peoples Pedagogy indicates that making connections to the local community is central to learning (*Science First*

Peoples Teacher Resource Guide). As one example, Elders and Knowledge Keepers offer a wealth of knowledge that can be shared with students. Consider inviting a local Elder or Knowledge Keeper as a guest into the classroom in connection with specific topics being studied (as identified within the given lessons throughout the module). An Elder or Knowledge Keeper can guide a nature walk, share stories and experiences, share traditional technologies, and help students understand Indigenous peoples' perspectives of the natural world. Elders and Knowledge Keepers will provide guidance for learners and opportunities to build bridges between the school and the community.

Here are a few suggestions about working with Elders and Knowledge Keepers:

- Elders and Knowledge Keepers have a deep spirituality that influences every aspect of their lives and teachings. They are recognized because they have earned the respect of their community through wisdom, harmony, and balance in their actions and teachings. (see "Aboriginal Elder Definition" at <https://www.ictinc.ca/blog/aboriginal-elder-definition>).
- Some Indigenous keepers of knowledge are more comfortable being called "Knowledge Keepers" than "Elders." Be sensitive to their preference. In many communities, there are also "Junior Elders" who may also be invited to share their knowledge with students and school staff.
- Elders and Knowledge Keepers may wish to speak about what seems appropriate to them, instead of being directed to talk about something specific. It is important to respect this choice and not be directive about what an Elder or Knowledge Keeper will talk about during their visit.
- It is important to properly acknowledge any visiting Elders or Knowledge Keepers and

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their knowledge, as they have traditionally been and are recognized within Indigenous communities as highly esteemed individuals. There are certain protocols that should be followed when inviting an Elder or Knowledge Keeper to support student learning in the classroom or on the land. The *Science First Peoples Teacher Resource Guide* offers guidelines and considerations for this.

It is especially important to connect with Indigenous communities, Elders, and Knowledge Keepers in your local area, and to study local issues related to Indigenous peoples in British Columbia. Consider contacting Indigenous education consultants within your local school district or with the British Columbia Ministry of Education to access referrals. The following link provides a province-wide list of Indigenous contacts: <www.bced.gov.bc.ca/apps/imcl/imclWeb/AB.do>. Also, consider contacting local Indigenous organizations for referrals to Elders and Knowledge Keepers. Such organizations may also be able to offer resources and opportunities for field trips and place-based learning.

NOTE: It is important for educators to understand the significant contribution that Elders, Knowledge Keepers, and Indigenous communities make when they share their traditional knowledge. In their culture of reciprocity, this understanding should extend past giving a gift or honorarium to an Elder or Knowledge Keeper for sharing sacred knowledge. As such, educators should think deeply about reciprocity and what they can do beyond inviting Indigenous guests to their classrooms. Educators can expand their own learning and become connected to Indigenous people by, for example, engaging in Indigenous community events, working with the Education Department of the local Nations, or exploring ways to continue developing the relationship between the local Nations and educators in the district.

The First Nations Education Steering Committee of British Columbia has articulated the following **First Peoples Principles of Learning**:

- Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.
- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions.
- Learning involves generational roles and responsibilities.
- Learning recognizes the role of Indigenous knowledge.
- Learning is embedded in memory, history, and story.
- Learning involves patience and time.
- Learning requires exploration of one's identity.
- Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations.

These principles generally reflect First Peoples pedagogy, and have been considered in the development of *Hands-On Science*.

The First People Principles of Learning (FPPL) is a framework for approaching learning, or a worldview on what learning is and how it happens. Teachers are encouraged to find their own meaning in them, explore them with their class, and take them up in a way that is meaningful to them. They are embedded in the new curriculum—the new curriculum was created based on these principles. Teachers can make their own connections to the FPPL through the *Hands-On Science* resource. (Melanie Nelson, February 12, 2018)

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It is also important to note that the *Science First Peoples Teacher Resource Guide* recommends a 7E model for guiding experiential learning activities in science. This model suggests that the following elements are essential to the learning experience:

The 7E Model

Environment	■ using the local land (place-based learning)
Engage	■ inspiring curiosity and activating knowledge
Explore	■ investigating science concepts through hands-on experiences
Elders	■ connecting local Knowledge Keepers to learning
Explain	■ describing observations and sharing new knowledge
Elaborate	■ extending and enhancing learning
Evaluation	■ providing opportunities for students to demonstrate understanding and skills

These seven elements are strongly evident in the approach used in **Hands-On Science**, as is explained in the following sections.

For more information on First Peoples Pedagogy and First Peoples Principles of Learning, please see the *Science First Peoples Teacher Resource Guide*.

NOTE: Indigenous resources recommended in **Hands-On Science** are considered to be authentic resources, meaning that they reference the Indigenous community they came from, they state the individual who shared the story and gave permission for the story to be used publicly, and the person who originally shared the story is Indigenous. Stories that are works of fiction were written by an Indigenous author. For more information, please see *Authentic First Peoples Resources* at: <www.fnesc.ca/learningfirstpeoples/>.

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How to Use *Hands-On Science* in Your Classroom

Hands-On Science is organized in a format that makes it easy for teachers to plan and implement. Four modules address the selected topics of study for kindergarten to grade-two classrooms. The modules relate directly to the Big Ideas, Core Competencies, Curricular Competencies, and Content outlined in the Science Curriculum for British Columbia.

Multi-Age Teaching and Learning

Whether working with students in a single-grade classroom from kindergarten to grade two, or working with multi-age classes, teachers will find appropriate learning opportunities in *Hands-On Science*. The lessons meet the diverse needs of all students through the implementation of differentiated instruction and personalized learning.

The Science Curriculum for British Columbia establishes specific Big Ideas, Curricular Competencies, and Content for each grade level. *Hands-On Science* has worked within themes to infuse these Big Ideas, Curricular Competencies, and Content into multi-age modules (see the Curriculum Learning Framework at the beginning of each module). It is therefore important for teachers to work collaboratively with their colleagues across grade levels to determine how best to implement lessons. The Curriculum Learning Frameworks will also be helpful, as each one includes a grade-level focus for specific lessons. This will assist teachers in both single-grade classrooms or multi-age classrooms to identify lessons and topics appropriate to their class.

Differentiated instruction and personalized learning will also ensure the needs of all students are met during science lessons. For example, in any classroom, whether multi-age or single-grade, students will be working at varying levels of literacy. As such, some students may be communicating their learning through drawing, while others may use single words, and yet others write several sentences. The lessons in *Hands-On Science* are developed to foster growth and learning at all literacy levels.

The same situation may be evident in terms of numeracy. For example, some students may be using comparative nonstandard measurement, while other students may be capable of working with standard metric measurement units and devices. There is plenty of flexibility in *Hands-On Science* to ensure that all students' learning needs can be met through active, student-centred learning.

Module Overview

Each module features an overarching question that fosters inquiry related to the Big Ideas. The module also has its own introduction, which summarizes the general concepts and goals for the module. This introduction provides background information for teachers, planning tips, and lists of vocabulary related to the module, as well as other pertinent information (e.g., how to embed Indigenous perspectives).

Also included at the beginning of each module is a Curriculum Learning Framework, which is based on the Big Ideas and Learning Standards (Curricular Competencies and Content) from the Science Curriculum for British Columbia (https://curriculum.gov.bc.ca/).

The Curriculum Learning Framework identifies the Big Ideas, Sample Guided Inquiry Questions, and Content for each grade level. As well, Content is connected to specific lessons, which are listed below each Content concept. Although specific lessons were intentionally written for grade-level content, much of this content is interconnected. As such, the overarching theme of the module provides a variety of connections to all three grade levels and, therefore, offers many springboards to learning.

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Lesson Title
- provides a guided inquiry question related to the Learning Standards explored in the lesson

Information for Teachers
- presents basic scientific knowledge needed for activities

Explore
- presents whole-class and small-group activities which provide students with choice and opportunities to pose further inquiry questions while collaborating with peers
- details procedures, including higher-level questioning techniques, and suggestions for encouraging the development of concepts and skills
- identified as Explore Part One, Explore Part Two, and so on (when there is more than one in a lesson)

Expand
- provides opportunities for individual students to expand what they know, do, and understand
- empowers and encourages students to pose their own inquiry questions and conduct investigations, research, and projects individually, with support and facilitation by the teacher as needed; student success will depend on prior modelling, guided practice, and individual skills
- includes suggestions for Makerspace projects and Loose Parts exploration

Learning Centre
- supports diverse learners, promotes differentiated instruction, and is based on multiple-intelligences research (see page 17)
- includes a task card that remains at the centre, along with any required supplies and materials; review the task card before students work at the centre, to ensure they are familiar with the content and the expectations (students are not expected to read and comprehend all content on the card, but it serves as a guide for teachers and a visual prompt for students)

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1 Initiating Event: What Do We Observe, Think, and Wonder About Plants and Animals?

Information for Teachers

In this lesson, students will participate in place-based learning to explore plants and animals in a local natural environment. Encourage students to suggest local natural areas, and plan ahead to select a location.

NOTE: It is important to prepare for guest speakers and to ensure that students are appropriately prepared as well. Review behavioural expectations and discuss questions that students may wish to ask the guest. Be sure to have students thank the speaker for the visit and consider following up with written or illustrated thank you notes. It is also important to consider protocols for Elders. Please see the *Science First Peoples Teacher Resource Guide* (see References, page xx) for guidelines and considerations.

In preparing to explore nature with students, consider referring to the book, *A Place for Wonder: Reading and Writing Nonfiction in the Primary Grades*, by Georgia Heard and Jennifer McDonough (see References, page xxx).

Materials
- chart paper
- markers
- digital cameras
- magnifying glasses
- tweezers
- stretch gloves
- recycled bags
- string
- portable whiteboard or chart paper with a sturdy backboard

Engage
Discuss the location for the place-based learning. Ask:
- Who has been to this place before?
- How did you get there?

- What is it like there?
- What do you think we will see there? Smell? Hear? Feel?

Introduce the guided inquiry question: **What do we observe, think, and wonder about plants and animals?**

Explore Part One
Once the class has arrived at the place-based learning location, provide time for students to explore the area freely (under adult supervision). Provide access to materials such as digital cameras, magnifying glasses, tweezers, stretch gloves, garden tools for exploration, and recycled bags in which to collect artifacts.

As students explore, pose questions for them to ponder. For example:
- What are you examining?
- Why is it interesting to you?
- What can you tell me about it?
- What do you wonder about it?
- What do you see? Feel? Smell? Hear?

Expand
To prepare students for journaling, do a journal entry together as a class. This will require a portable whiteboard and markers, or chart paper with a sturdy backboard.
- sketching or colouring plants and animals in the natural environment
- collecting flowers or leaves, sketching them, and then pressing them in the journal

Learning Centre
At the learning centre, provide a variety of objects and photographs collected during the place-based learning experience. Also provide magnifying glasses, tweezers, scissors, glue, art paper, poster paper, construction paper, art supplies, and a copy of the Learning-Centre

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Materials
- lists all materials required to conduct the main activities
- includes items for display purposes or for recording students' ideas
- suggests visual materials (e.g., large pictures, sample charts, diagrams) to assist in presenting ideas and questions and encourage discussion
- connects to Image Bank visuals, which may be printed or projected for specific activities (see Appendix on page 149 for thumbnails and free access)

Engage
- activates prior knowledge, piques students' curiosity about related concepts, and introduces the lesson's guided inquiry question
- models for students how to pose their own inquiry questions; teachers may choose to record the guided inquiry question (e.g., on a sentence strip) for display, so students can refer to it during activities and discussions

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Reproducibles
- may be used to guide activities or record data
- may also serve as a template for designing and constructing graphic organizers
- included as thumbnails in the lessons
- provided as full-sized, printable version on the Portage & Main website (see Appendix for URL and password)

Enhance
- enriches and elaborates on the Big Idea, Core Competencies, and Learning Standards with optional activities
- encourages active participation and learning through Family Connections

Embed Part One
- provides students with opportunities to participate in a Talking Circle (see page 16) to demonstrate their learning through consolidation and reflection
- allows for synthesis and application of inquiry and new ideas
- reviews main ideas of the lesson, focusing on the Big Idea, Core Competencies, and Learning Standards
- reviews guided inquiry question so students can share their knowledge, provide examples, and ask further inquiry questions

Embed Part Two
- embeds learning by adding to graphic organizers; having students record, describe, and illustrate new vocabulary; and adding new vocabulary to the word wall throughout the module or even all year
- provides opportunity to reflect the cultural diversity of the classroom and the community by including new terminology in languages other than English, including Indigenous languages
- explores Core Competencies with students to foster student self-assessment of how these skills were used throughout the lesson

Assessment
- provides suggestions for authentic assessment
- includes student self-assessment, formative assessment, and summative assessment (see pages 29–34)

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> **Learning Centre**
>
> **How Can I Sort Objects From Nature?**
>
> 1. Look at each object from our nature walk.
> 2. Describe how it looks, feels, smells, and sounds. (Do not taste it!)
> 3. Sort the objects into the bins.
> 4. Describe your sorting rules to others.

they demonstrated that competency. Ask questions directly related to that competency to inspire discussion. For example:
- Where did you get your ideas for your place-based journal entry today? (Creative Thinking)

Have students reflect orally, encouraging participation, questions, and the sharing of evidence (See page xx in the introduction for more information on these templates).

As part of this process, students can also set goals. Ask:
- What would you do differently next time and why?
- How will you know if you are successful in meeting your goal?

NOTE: Use the same prompts from these templates over time to see how thinking changes with different activities.

Embed Part One: Talking Circle
Revisit the guided inquiry question: **What do we observe, think, and wonder about plants and animals?** Have students share their experiences and knowledge, provide examples, and ask further inquiry questions.

Embed Part Two
- Focus on students' use of the Core Competencies. Have students reflect on how they used one of the Core Competencies (Thinking, Communicating, or Personal and Social skills) during the various lesson activities. Project one of the CORE COMPETENCY DISCUSSION PROMPTS templates (page xx–xx), and use it to inspire group reflection. Referring to the template, choose one or two "I Can" statements on which to focus. Then, have students use the "I Can" statements to provide evidence for how

Enhance
- **Family Connection:** Provide students with the following sentence starter:
  - A favourite place for us to visit outside is_____.

  Have students take home the sentence starter to complete. Family members can help the student draw and write about this topic.

Student Self-Assessment Ⓔ
Have students complete the COOPERATIVE SKILLS SELF-ASSESSMENT template, on page xx, to reflect on their success working with others, as they share and compare ideas.

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The Curricular Competencies Correlation Chart at the beginning of each module provides details on how students' Curricular Competencies are developed through scientific inquiry. The chart outlines the skills, strategies, and processes that students use in the module and identifies the specific lessons in which these Curricular Competencies are the focus. The Curricular Competencies are developed in various ways over time, and therefore are addressed in multiple lessons throughout *Hands-On Science* modules.

Each module includes a list of related resources for students (books, websites, and online videos).

Each module is organized into lessons based on the Learning Standards. The first lesson in each module provides an initiating event, using an Observe-Think-Wonder strategy. Real-life explorations, often within the local environment, provide opportunity for place-based learning, which is discussed in more detail on page 18.

The second lesson in each module explores storytelling as it relates to the inquiry topics. This lesson includes an emphasis on Indigenous stories, children's literature, and nonfiction texts, while providing opportunities for students to engage in activities that focus on literacy and creative storytelling.

The last lesson in each module provides an opportunity for personalized learning through individualized inquiry, as students explore what more they would like to know, do, and understand about the module's Big Ideas.

Talking Circles

Talking Circles originated with First Nations leaders as a process to encourage dialogue, respect, and the co-construction of ideas. The following process is generally used in a Talking Circle:

- the group forms a complete circle
- one person holds an object such as a stick, feather, shell, or stone
- only the person holding the stick talks, while the rest listen
- the stick is passed around in a clockwise direction
- each person talks until they are finished, being respectful of time
- the Talking Circle is complete when everyone has had a chance to speak
- a person may pass the stick without speaking, if they choose

See <www.firstnationspedagogy.ca/circletalks.html> for more information. Also consider inviting a local Elder or Knowledge Keeper to share with the class the process of a Talking Circle.

Multiple Intelligences Learning Centres

Learning centres in *Hands-On Science* focus on a different multiple intelligence to provide opportunities for students to use areas of strength and also to expose them to new ways of learning.

Teachers are encouraged to explore the topic of multiple intelligences with their students and to have students self-reflect to identify ways they learn best, and ways that are challenging for them. Guidelines for this process are included in *Teaching to Diversity* by Jennifer Katz (see References, page 21).

Multiple Intelligence		These learners…
Verbal-Linguistic	V-L	…think in words and enjoy reading, writing, word puzzles, and oral storytelling.
Logical-Mathematical	L-M	…think by reasoning and enjoy problem solving, puzzles, and working with data.
Visual-Spatial	V-S	…think in visual pictures and enjoy drawing and creating visual designs.
Bodily-Kinesthetic	B-K	…think by using their physical bodies and enjoy movement, sports, dance, and hands-on activities.
Musical-Rhythmic	M-R	…think in melodies and rhythms and enjoy singing, listening to music, and creating music.
Interpersonal	INTER	…think by talking to others about their ideas and enjoy group work, planning social events, and taking a leadership role with friends or classmates.
Intrapersonal	INTRA	…think within themselves and enjoy quietly thinking, reflecting, and working individually.
Naturalistic	N	…learn by classifying objects and events and enjoy anything to do with nature and scientific exploration of natural phenomena.
Existential	EX	…learn by probing deep philosophical questions and enjoy examining the bigger picture as to why ideas are important.

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Icons

To provide a clear indication of important features of **Hands-On Science**, the following icons are used throughout lessons:

Place-Based Learning	Place-based learning focuses on the local environment and community. It is important for students to explore the local area in order to build personalized and contextual knowledge.
	Place-based learning:
	■ emphasizes exploring the natural environment, replacing classroom walls with the natural land
	■ offers firsthand opportunities to observe, explore, and investigate the land, waters, organisms, and atmosphere of the local region
	■ promotes a healthy interplay between society and nature
	■ helps students envision a world where there is meaningful appreciation and respect for our natural environment—an environment that sustains all life
	Many lessons in **Hands-On Science** incorporate place-based learning activities, whether it be a casual walk around the neighbourhood to examine trees or a more involved exploration of local waterways.
Applied Design, Skills, and Technologies	Throughout **Hands-On Science**, students have opportunities to use applied design, skills, and technologies to plan and construct objects. For example, in *Living Things for Grades K–2*, students design and construct models of an animal's environment to show how the animal meets its basic needs.
	Using applied design skills and technology, students seek solutions to practical problems through research and experimentation. There are specific steps:
	1. Identify a need. Recognize practical problems and the need to solve them.
	2. Create a plan. Seek alternate solutions to a given problem, create a plan based on a chosen solution, and record the plan through writing and labelled diagrams.
	3. Develop a product or prototype. Construct an object that solves the given problem, and use predetermined criteria to test the product.
	4. Communicate the results. Identify and make improvements to the product, and explain the changes.
Ecology and the Environment	**Hands-On Science** provides numerous opportunities for students to investigate issues related to ecology, the environment, and sustainable development. The meaning of sustainability can be clarified by asking students: "Is there enough for everyone, forever?" These topics also connect to Indigenous worldviews about respecting and caring for the Earth.
Technology	Digital learning, or information and communication technology (ICT), is an important component of any classroom. As such, technological supports available in schools—digital cameras, computers/tablets, interactive whiteboards (IWB), projectors, document cameras, audio-recording devices, calculators—can be used with and by students to enhance their learning experiences.
Classroom Safety	When there are safety concerns, teachers may decide to demonstrate an activity, while still encouraging as much student interaction as possible. The nature of science and scientific experimentation means that safety concerns do arise from time to time.

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Makerspace Centres

To foster open inquiry and promote personalized learning, each module of *Hands-On Science* suggests a Makerspace centre as part of the Expand section. A Makerspace is a creative do-it-yourself environment, where participants pose questions, share ideas, and explore hands-on projects. In the school setting, a Makerspace is usually cross-curricular and should allow for inquiry, discovery, and innovation. Sometimes, the Makerspace is housed in a common area, such as the library, which means it is a space used by the whole school community. A classroom Makerspace is usually designed as a centre where students create do-it-yourself projects, emphasizing personalized learning, while collaborating with others on cross-curricular ideas. It is important to remember learning is not directed here. Rather, simply create conditions for learning to happen.

There is no list of required equipment that defines a Makerspace; however, the centre may evolve to foster inquiry within a specific topic. Students are given the opportunity to work with a variety of age-appropriate tools, as well as with everyday, arts-and-crafts, and recycled materials. Materials to consider at Makerspace centres include:

- general supplies (e.g., graph or grid paper for planning and designing, pencils, markers, paper, cardstock, cardboard, scissors, masking tape, duct tape, glue, rulers, metre sticks, tape measures, elastic bands, string, Plasticine, modelling clay, fabric/cloth, straws, pipe cleaners, aluminum foil)
- recycled materials (e.g., various sizes of boxes, cardboard rolls, milk cartons, plastic bottles, spools, plastic lids)
- art supplies (e.g., paper, paint, markers, chalk, pastels, crayons, pencil crayons, beads, sequins, foam shapes, yarn, glass beads)
- building materials (e.g., sticks, wooden blocks, wooden dowels, toothpicks, craft sticks, balsa wood)
- age-appropriate tools (e.g., hammers, nails, screwdrivers, screws)
- natural objects (e.g., rocks, shells, feathers, seeds, wood slices, sticks)
- commercial products (e.g., LEGO, LEGO Story Starter, WeDo, MakeDo, Meccano, Plus-Plus, K'Nex, KEVA Planks, Dominoes, Wedgits)
- technology (e.g., Green Screen, iPads, coding/programming [Beebots, Code-a Pillar], apps such as Hopscotch, Tynker, Scratch Jr., Tickle)
- topic-based literature to inspire projects
- reference materials (e.g., books, videos, websites, visual images)

Work with students to develop a collaborative culture in which they tinker, invent, and improve on their creations. Ask students for ideas on how to stock the Makerspace, based on their project ideas, and then work collaboratively to acquire these supplies. The internet may also provide ideas for projects and materials.

Set up a recycling box/bin in the Makerspace centre for paper, cardboard, clean plastics, and other materials students can use for their creations. Stress to students that Makerspaces can help reuse many items destined for a landfill. Discuss which items can/should be placed in this bin.

Some things to consider when planning and developing a Makerspace centre are:

- Always address safety concerns, ensuring materials, equipment, and tools are safe for student use. Include safety gloves and goggles, as appropriate. Engage students in a discussion about safety and respect at the Makerspace before beginning each module. Consider sharp objects, small parts,

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and other potential hazards for students of all ages and abilities who will have access to the Makerspace centre. At this age, this exploration needs to be supervised.

■ Consider space and storage needs. Mobile carts and/or bins are handy for storing raw materials and tools.

■ Work with students to write a letter to parents/guardians, explaining the purpose of the Makerspace, and asking for donations of materials.

In **Hands-On Science**, each module includes a variety of suggestions for Makerspace materials, equipment, possible challenges, and literature links related to the Big Ideas being explored.

The Makerspace process is intended for solving design problems, so it is helpful to have visuals at the Makerspace centre to encourage innovation, creativity, and the use of Applied Design, Skills, and Technologies (see page 18). In addition, although individual inquiry is encouraged, the Makerspace process is often collaborative in nature. Therefore, it is important to focus on skills related to working with others (see the Cooperative Skills Assessment templates on pages 49 and 51).

Before students begin working at a Makerspace centre, review Applied Design, Skills, and Technologies and collaborative skills with students. As a class, co-construct criteria for each skill, record on chart paper, and display at the Makerspace centre. Or, challenge students to create posters for the Makerspace centre that convey what Applied Design, Skills, and Technologies and collaboration look like. Refer to these visual prompts before, during, and after students work at the centre, as a means of guiding and assessing the process.

As students create, photograph their creations to share with the class, and discuss the unique properties of their designs. Model appropriate

digital citizenship with students by asking their permission to photograph and share their creations. Facilitate regular debriefing sessions as a class, after students have spent time at the Makerspace centre. Consider focusing this discussion on the Core Competencies (Thinking, Communication, and Personal and Social Skills) as an anchor for reflective practice.

The nature of a Makerspace is such that it provides an excellent venue for personalized learning. As students pose their own inquiry questions, they may choose to use the Makerspace to explore that question further.

Loose Parts

Closely related to the open inquiry fostered by the Makerspace, the theory of Loose Parts was first proposed back in the 1970s by architect Simon Nicholson. He believed it is the Loose Parts in our environment that empower our creativity. The theory has begun to influence early years educators intent on offering students opportunities to play freely with objects and materials, and to pose their own questions and investigations. Loose Parts include anything natural or synthetic (e.g., beads, buttons, fabric, washers and nuts, cardboard rolls, pom poms, acorns, leaves) that students can move, control, and manipulate. Loose Parts promote open-ended thinking that leads to problem solving, curiosity, and creativity. Play and learning possibilities are endless, as there is no single outcome that is achieved. Instead, Loose Parts offer opportunities for students to consider a wide range of possibilities and ideas.

When appropriate, provide provocations (questions to inspire play) that offer an entry point for a Loose Parts activity. As an example, while studying living things, teachers may provide bins of stones, twigs, bark, shells, and seed pods with the provocation, "How many different ways can you sort the objects?"

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Students may begin with such a sorting task, but expand to build structures, compare and measure, or examine patterns on the various objects.

Throughout **Hands-On Science**, Loose Parts are used to engage students and as an opportunity to expand investigations, generate their own inquiry questions, and personalize learning. Suggestions for Loose Parts exploration are included in the Expand section of lessons. For more information about Loose Parts, see *Loose Parts: Inspiring Play in Young Children* by Lisa Daly and Miriam Beloglovsky and *Loose Parts: A Start-Up Guide* by Sally Haughey and Nicole Hill.

References

British Columbia Ministry of Education. *BC's New Curriculum.* 2016. <https://curriculum.gov.bc.ca/>

Daly, Lisa, and Miriam Beloglovsky. *Loose Parts: Inspiring Play in Young Children*. Redleaf Press, 2014.

Haughey, Sally, and Nicole Hill. *Loose Parts: A Start-Up Guide*. Fairy Dust Teaching, 2017.

Katz, Jennifer. *Teaching to Diversity*. Winnipeg, MB: Portage & Main Press, 2012.

"Talking Circles." *First Nations Pedagogy Online.* <www.firstnationspedagogy.ca/circletalks.html>

The *Hands-On Science* Assessment Plan

Hands-On Science provides a variety of assessment tools that enable teachers to build a comprehensive and authentic daily assessment plan for students. Based on current research about the value of quality classroom assessment (Davies, 2011), suggestions are provided for authentic assessment, which includes student self-assessment and reporting of Core Competencies.

British Columbia's K–12 Assessment System (see <https://curriculum.gov.bc.ca/assessment-system> and <https://curriculum.gov.bc.ca/classroom-assessment-and-reporting>) states:

> Assessment and curriculum are interconnected. Curriculum sets the learning standards that give focus to classroom instruction and assessment. Assessment involves the wide variety of methods or tools that educators use to identify student learning needs, measure competency acquisition, and evaluate students' progress toward meeting provincial learning standards.

> [British Columbia's] assessment system is being redesigned to align with the new curriculum. Assessment of all forms will support a more flexible, personalized approach to learning and measure deeper, complex thinking. [British Columbia's] educational assessment system strives to support student learning by providing timely, meaningful information on student learning through multiple forms of assessment. The assessment system has three programs:

> 1. Classroom Assessment and Reporting

> 2. Provincial Assessment

> 3. National and International Assessment

> Classroom assessment is an integral part of the instructional process and can serve as a meaningful source of information about student learning. Feedback from ongoing assessment in the classroom can be immediate and personal for a learner and guide the learner to understand their [strengths and challenges] and use the information to set new learning goals.

The primary purpose of assessment is to improve student learning. *Hands-On Science* provides assessment suggestions, rubrics, and templates for use during the teaching/learning process. These assessment suggestions include tasks related to *student self-assessment* of the Core Competencies, as well as *formative assessment* and *summative assessment* by the teacher.

Student self-assessment helps students develop their capacity to set their own goals, monitor their own progress, determine their next steps in learning, and reflect on their learning in relation to the three Core Competencies—Thinking, Communication, and Social and Personal.

Formative assessment requires that teachers provide students with descriptive feedback and coaching for improvement in relation to the Learning Standards (Curricular Competencies and Content).

Summative Assessment is comprehensive in nature, and is intended to identify student progress in relation to the Learning Standards (Curricular Competencies and Content).

Both summative and formative assessments are an integral part of a balanced classroom assessment plan. Then, when student self-assessment is infused in this assessment plan, a clearer picture emerges of where a student is in relation to the Core Competencies and Learning Standards.

Student Self-Assessment

It is important for students to reflect on their own learning. For this purpose, a variety of assessment templates are provided in *Hands-On Science*. Depending on their literacy levels, students may complete self-assessments in various ways. For example, the templates may be used as guides for oral conferences between teacher and student, or an adult may act as a

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Date: _____   **Name:** _____

Student Reflections

What I Did	What I Learned

Next Steps in My Learning	My Strengths and Challenges

Core Competency Self-Reflection Frame
Communication

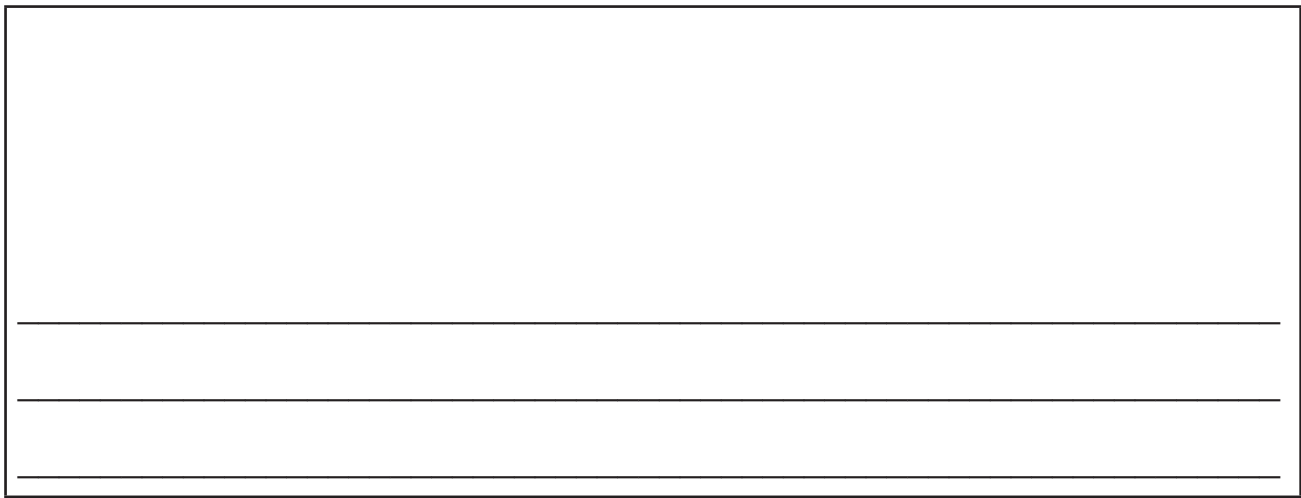| I Can...	Examples	Next Steps
I can answer questions.		
I can listen to others when they speak.		
I can share my learning.		
I can work in a group.		

Family and Community Connections: Assessing Together

Family/Community Member's Name: _____

Draw a picture that shows what you have been learning in science. Work together to label your picture and describe your learning in words.

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│  _____  │
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└─────────────────────────────────────────────┘
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What do you like best about what you have been learning in science?

_____

_____

_____

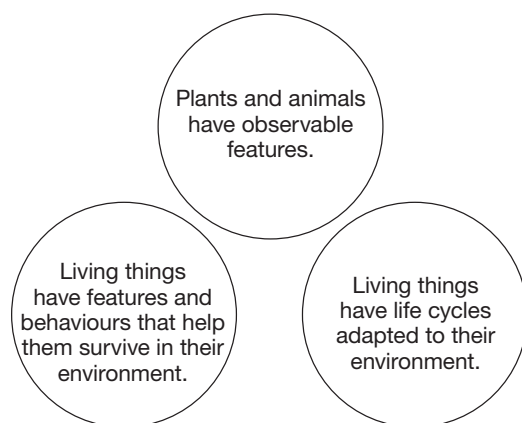**What does your family/community member like best about what you have been learning in science?**

_____

_____

_____

_____

What Are the Features of Plants and Animals?

About This Module

This module of **Hands-On Science** focuses on plants and animals. Students will conduct investigations that explore the following Big Ideas:

Plants and animals have observable features.

Living things have features and behaviours that help them survive in their environment.

Living things have life cycles adapted to their environment.

While investigating these Big Ideas, the Curricular Competencies will be addressed, as students use the following skills, strategies, and processes:

QP	questioning and predicting
PC	planning and conducting investigations
PA	processing and analyzing data and information
AI	applying and innovating
C	communicating
E	evaluating

Incorporate Indigenous perspectives and worldviews into lessons whenever possible, including the following:

- recognize that Indigenous communities have protocols for working with different plants and animals, that even animal parts should be treated with respect, that animal parts have uses or are returned to the Earth, and that animals and parts are used in ceremony
- maintain a respectful relationship with nature, with an intention to sustain natural resources for generations to come
- understand that all life—plant, animal, and human—is equal and related, and that all living things depend upon one another for survival
- understand that humans have special relationships with animals, which are seen as teachers, guides, and companions and are key to human survival
- acknowledge that life is cyclical, and that plants and animals have daily, annual, and multi-year life cycles
- recognize that the First Peoples Principles of Learning ultimately support the well-being of the self, the family, the community, the land, the spirits, and the ancestors (see First Peoples Principles of Learning, page 12)

When implementing place-based learning, there are many opportunities to consider Indigenous perspectives and knowledge. Outdoor learning provides an excellent opportunity to identify the importance of place. For example, use a map of the local area to have students identify where the place-based learning location is in relation to the school. This will help students develop a stronger image of their community and surrounding area.

Identify on whose traditional territory the school is located, as well as the traditional territory of the location for the place-based learning. The following map, "First Nations in British Columbia," from Indigenous Services Canada can be used for this purpose: <www.aadnc-aandc.gc.ca/DAM/DAM-INTER-BC/STAGING/texte-text/inacmp_1100100021016_eng.pdf>.

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Curriculum Learning Framework

	K	1	2
Big Idea	Plants and animals have observable features.	Living things have features and behaviours that help them survive in their environment.	Living things have life cycles adapted to their environment.
Sample Guided Inquiry Questions	■ How do the different features of plants and animals help them meet their basic needs? ■ What basic needs do plants and animals have in common? ■ What are your basic needs?	■ How do local plants and animals depend on their environment? ■ How do plants and animals use their features to respond to stimuli in their environments? ■ How do plants and animals adapt when their basic needs are not being met?	■ Why are life cycles important? ■ How are the life cycles of local plants and animals similar and different? ■ How do offspring compare to their parents?
Content	■ basic needs of plants and animals [lesson 2, 3, 6, 7, 9, 14] ■ adaptations of local plants and animals [lesson 2, 4, 5, 7, 9, 14] ■ local First Peoples uses of plants and animals [lesson 2, 6, 10, 15]	■ classification of living and non-living things [lesson 1, 2, 3, 4, 5] ■ names of local plants and animals [lesson 1, 2, 4, 5, 8, 13, 14] ■ structural features of living things in the local environment [lesson 1, 2, 4, 5, 6, 9, 13] ■ behavioural adaptations of animals in the local environment [lesson 2, 7, 9]	■ metamorphic and non-metamorphic life cycles of different organisms [lesson 2, 12] ■ similarities and differences between offspring and parent [lesson 2, 4, 11] ■ First Peoples use of their knowledge of life cycles [lesson 2, 12, 15]
Core Competencies	*Thinking* *Communicating* *Social and Personal*		

Curricular Competencies Correlation Chart

Throughout this module, students will develop Curricular Competencies by participating in rich learning experiences that focus on specific skills, strategies, and processes. The chart below suggests ways in which students explore Curricular Competencies in specific lessons.

Curricular Competencies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(QP) Questioning and Predicting																
Demonstrate curiosity and a sense of wonder about plants and animals.	√	√	√	X	√	√	√	√	√	√	√	√	√	√	√	√
Observe plants and animals in familiar contexts.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Ask simple questions about familiar plants and animals.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Make simple predictions about familiar plants and animals.	√			√								√		√		
(PC) Planning and Conducting Investigations																
Make exploratory observations using their senses.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Record observations.	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√
Safely manipulate materials.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Make simple measurements using non-standard units.														√	√	√
(PA) Processing and Analyzing Data and Information																
Experience and interpret the local environment.	√		√	√					√			√	√	√		
Recognize First Peoples stories (including oral and written narratives), songs, and art, as ways to share knowledge.	√	√	√	√	√		√	√	√	√		√			√	
Discuss observations about plants and animals.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Represent observations and ideas by drawing charts and simple pictographs.					√		√	√				√				√

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Curricular Competencies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sort and classify data and information using drawings, pictographs, and provided tables.			√	√						√			√			√
Compare observations with predictions through discussion.	√			√								√		√		
Identify simple patterns and connections related to plants and animals.			√									√				

(AI) Applying and Innovating

Curricular Competencies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Take part in caring for self, family, classroom, and school through personal approaches.			√			√	√				√					
Transfer and apply learning to new situations.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Generate and introduce new or refined ideas when problem solving.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

(C) Communicating

Curricular Competencies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Share observations and ideas orally, or through written language, drawing, or role-play.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Express and reflect on personal experiences of place.	√		√	√						√			√	√	√	

(E) Evaluating

Curricular Competencies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Compare observations of plants and animals with those of others.	√				√		√	√				√		√	√	
Consider some environmental consequences of their actions as related to plants and animals.	√						√				√	√				

7 | What Are the Needs of Living Things?

Information for Teachers

All living things require food, water, air, sunlight, and space/shelter in order to survive.

In this lesson, students will explore the needs of plants, humans, and other animals. It is essential that students do not see themselves (as humans) in a category distinct from other animals.

Materials

- pictures of animals, including humans (one for each pair of students)
- variety of local plants in pots (e.g. house plants, bedding plants) (one for each pair of students)
- Indigenous stories about plants and animals (see Engage)
- computer/tablet with internet and printer access
- live samples of living things humans might care for (e.g., class animal, potted plants)
- Image Bank: Animal Homes (see Appendix, page 149)
- picture books about living things
- projection device
- sand table
- art supplies
- video-recording device
- magnifying glasses
- drawing paper
- modelling clay or Plasticine
- building materials for animal homes (e.g., sticks, leaves, moss, rocks, thread, cotton, tissue paper)
- plastic animals
- chart paper
- markers
- poster or mural paper (optional
- Learning-Centre Task Card: How Do We Take Care of a Living Thing? (1.7.1)
- KWHL chart (from lesson 3)

Engage

As a class, share stories about living things in their environment. If possible, invite a local Elder or Knowledge Keeper to share stories, with a focus on the needs of plants and animals for survival.

NOTE: See Indigenous Perspectives and Knowledge, page 9, for guidelines for inviting Elders and Knowledge Keepers to speak to students.

Books by Indigenous authors may also be shared:

- *Animals of the Salish Sea* by Melaney Gleeson-Lyall
- *Northwest Coast Native Animals* by Kelly Robinson
- *Mayuk the Grizzly Bear* by Sechelt Nation and Charlie Craigan
- *Lessons From Mother Earth* by Elaine McLeod
- *How Do Plants Grow?* by Terri Mack

Introduce the guided inquiry question: **What are the needs of living things?**

Explore Part One

Organize the class into pairs. Give each pair a different picture of an animal (be sure to include humans). Have pairs look at their picture, identify the animal, describe its characteristics, and discuss what the animal needs in order to survive.

Have each pair share their picture with the class. Then as a class, discuss some things these animals need to survive (food, water, air, sunlight, space/shelter). Discuss specific animals and identify how they meet their needs. For example, ask:

- What does a salmon eat?
- Where does a bear get shelter?

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- Where does an elephant get water?
- Why is sunlight important for a bee?
- How does a whale get air?

Have students share their ideas about how these animals meet their needs.

Explore Part Two

Organize the class into working groups. Display the local plants, and have each group select one plant to investigate. Provide magnifying glasses and drawing paper. Have students examine their plant and discuss its characteristics. Encourage them to use the magnifying glasses for close observations. Also have students draw diagrams of their plants.

Have each group present their plant to the class and describe its features. As a class, work to identify each plant by name. Ask:

- What do plants need to stay alive?
- How do plants get water?
- Why is sunlight important to a plant?
- How do plants get food?

NOTE: Students may not be familiar with how plants get food, but the discussion here can focus on the fact that they do not eat in the same way animals do.

As a class, view the video, "The Needs of a Plant" at: <https://www.youtube.com/watch?v=dUBIQ1fTRzI>.

After watching the video, discuss as a class the basic needs of all living things. Ask:

- Do you see any needs that are the same for plants and animals (or for humans and other animals, or for plants and humans)?
- Do you see any needs that are different?

Review the diverse ways living things meet their needs.

Explore Part Three

Provide an opportunity for students to explore animal homes through playful investigations at the various classroom centres. Display copies of the images from the Image Bank: Animal Homes at the appropriate centres. Set up the following centres:

Water Table

Add materials to a water table, so students can make beaver dams. Include rocks, sticks, plastic beavers (or waterproof Plasticine to make beavers), as well as images of beaver dams.

Sand Table

Add assorted plastic animals that make their homes underground (e.g., ants, groundhogs, rabbits, prairie dogs, gophers) or provide modelling clay or Plasticine, so students can make these animals. Also include various images of tunneling animals.

Art Centre

Provide modelling clay, Plasticine, and assorted materials (e.g., sticks, leaves, moss, rocks, thread, cotton, tissue paper) for students to make dens, caves, and trees. Also provide images of animal homes to encourage construction of these shelters.

Expand

Have individual students contribute to the creation of a class big book on the needs of living things. On six large sheets of paper (chart, poster, or mural paper), record the following sentences:
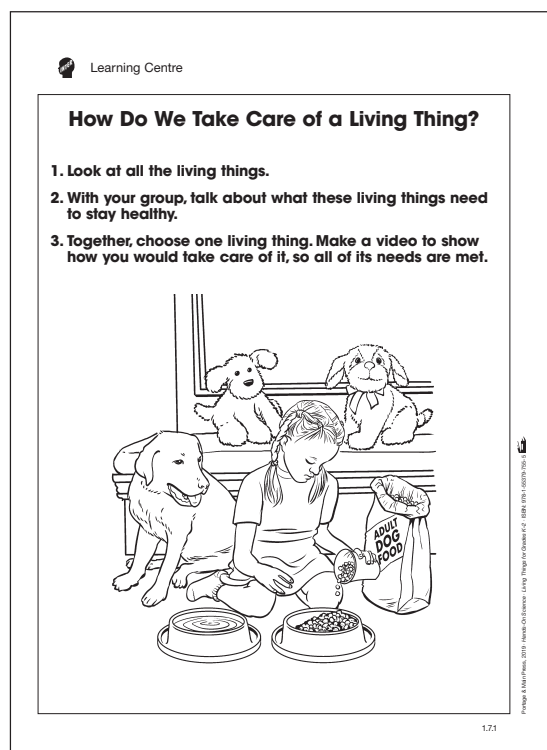
- Living things need food.
- Living things need water.
- Living things need air.
- Living things need sunlight.
- Living things need space.
- Living things need shelter.

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Have students review picture books or visit suitable bookmarked websites to look for examples of living things to illustrate for these pages. Provide each student with six index cards and art supplies to create illustrations for each of these pages.

When students have completed the sheets, bind the pages together in a class big book, and have students design a cover page.

Learning Centre

At the learning centre, supply pictures, live examples, and models of living things humans might care for (e.g., pets, house plants, farm animals, garden plants). Provide a video-recording device and a copy of the Learning-Centre Task Card: How Do We Take Care of a Living Thing? (1.7.1):

Learning Centre

How Do We Take Care of a Living Thing?

1. Look at all the living things.
2. With your group, talk about what these living things need to stay healthy.
3. Together, choose one living thing. Make a video to show how you would take care of it, so all of its needs are met.

1.7.1

Download this template at <https://www.portageandmainpress.com/product/HOSLivingThingsK2>.

Have students visit the centre in groups to select one living thing from the collection and brainstorm how they would care for it. Have students make a video with instructions for caring for this living thing.

Model this process for the class. Begin by having students suggest criteria for the video. For example:

- include the name of the living thing
- describe what its needs are
- explain how you would help it meet its needs
- be sure all group members take part in making the video

Record these criteria and display them at the centre, so students can refer to them while making their videos.

Select a living thing to model the process of making a video. Have one student act as videographer. As a class, share ideas as to how to care for the selected living thing. Record these ideas on chart paper, and refer to them while presenting/recording the video. Ensure that the class reviews the video to see how criteria were met.

Embed Part One: Talking Circle

Revisit the guided inquiry question: **What are the needs of living things?** Have students share their knowledge and experiences, provide examples, and ask further inquiry questions.

Embed Part Two

- Add to the KWHL chart as students learn new concepts, answer some of their own inquiry questions, and ask new inquiry questions.

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- Add new terms and illustrations to the word wall. Include the words in languages other than English, such as Indigenous languages, as appropriate.

- Focus on students' use of the Core Competencies. Have students reflect on how they used one of the Core Competencies (Thinking, Communicating, or Personal and Social Skills) during the various lesson activities. Project one of the CORE COMPETENCY DISCUSSION PROMPTS templates (pages 38–42), and use it to inspire group reflection. Referring to the template, choose one or two "I Can" statements on which to focus. Then, have students use the "I Can" statements to provide evidence for how they demonstrated that competency. Ask questions directly related to that competency to inspire discussion. For example:
  - How did you show that you were an active listener today? (Communication)

  Have students reflect orally, encouraging participation, questions, and the sharing of evidence. (See page 29 in the Introduction for more information on these templates.)

  As part of this process, students can also set goals. Ask:
  - What would you do differently next time and why?
  - How did you decide which questions to ask today? (Critical Thinking)

- To further encourage self-reflection, provide prompts that students can use to cite examples of how they have used the Core Competencies in their learning. For this purpose, the CORE COMPETENCY SELF-REFLECTION FRAMES (pages 43–47) can be used throughout the learning process. There are five frames provided to address the Core Competencies: Communication, Creative Thinking, Critical Thinking, Positive Personal and Cultural Identity, and Personal

Awareness and Responsibility. Teachers can conference individually with students to support self-reflection, or students may complete prompts using words and pictures.

Again, have students set goals by considering what they might do differently on future tasks and how they will know if they are successful in meeting their goal.

NOTE: Use the same prompts from these templates over time to see how thinking changes with different activities.

Formative Assessment Ⓒ

Conference with students individually. Invite students to bring the animal or live plant they examined at the learning centre. Have them share their lesson and learning-centre experiences with you, and explain what all living things need to live and stay healthy. Focus on their ability to share observations and ideas orally and through role play with the plant or animals. Record observations on the INDIVIDUAL STUDENT OBSERVATIONS template, on page 51. Provide descriptive feedback to students about how they share observations and ideas orally.

Enhance 🖥️

- **Family Connections:** Provide students with the following sentence starter:
  - We meet our needs at home by _____.

  Have students take home the sentence starter to complete. Family members can help students draw and write about this topic.

- Select a class animal for students to look after. Stress the importance of proper care and handling of the animal. With students, research information about the animal. Discuss the animal's needs prior to its arrival, and record these on chart paper. Based on the research, have students plan a home for the animal. Display care guidelines close to

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the animal's home (e.g., aquarium) where all students can see them. Discuss ways to ensure all the animal's daily needs will be met.

When students are ready to care for the animal, introduce the animal to them. Choose a name for the animal. Create a responsibility schedule, so all students experience the responsibility of caring for and looking after the needs of the animal. Creating and following a schedule will also help to prevent overfeeding.

Set guidelines for visiting the animal centre (e.g., how many students can be there at the same time, for how long). Teachers are encouraged to restrict students from visiting the centre without some form of supervision.

NOTE: Choosing your class animal: Many animals are suitable for the classroom environment. Fish are easily cared for, and a fish tank provides an excellent observation centre. You may also choose to have guest animals visit the classroom each month (e.g., bird, rabbit, gerbil, snake). Doing so introduces students to a variety of animals.

⚠ SAFETY NOTE: Consider any student allergies before selecting an animal to visit the classroom.

Appendix: Image Banks

Images appearing in this appendix are thumbnails from the Image Banks referenced in the lessons. Corresponding full-page, high-resolution images can be printed or projected for the related lessons, and are found on the Portage & Main Press website at: <www.portageandmainpress.com/product/xxxxxxxxxxxxxxxx/>. Use the password xxxxxxxxxxxxxx to access the download for free. This link and password can also be used to access the reproducible templates for this module.

Please follow these steps to retrieve the images and reproducible templates for this module.

1. Go to <www.portageandmainpress.com/product/xxxxxxxxxxxx/>.
2. Type the password _____ into the password field.
3. Select Add to Cart.
4. Select View Cart.
5. Select Proceed to Checkout. No coupon code is required.
6. Enter your billing information or log in to your existing account using the prompt at the top of the page.
7. Select Place Order.
8. Under Order Details, click the link for your download.
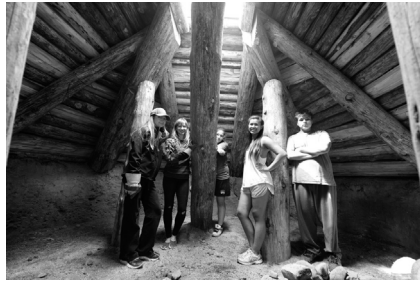9. Save the file to the desired location on your computer.

NOTE: This is a large file. Download times will vary due to your internet speeds.

Lesson 6: What Do We Need to Grow and Be Healthy?
Homes

1. The Kwakwaka'wakw Mungo Martin House

2. Reconstructed Dakelh Pit House

Students from the University of Northern British Columbia and Lheidli T'enneh First Nation building a traditional pit house.

3. Reconstructed Dakelh Pit House

Students from the University of Northern British Columbia and Lheidli T'enneh First Nation building a traditional pit house.

4. 'Namgis Traditional Big House

5. Farmhouse

6. Apartment Buildings

7. Condominiums

8. Condominiums

9. Duplex

About the Contributors

Jennifer Lawson, PhD, is the originator and senior author of the Hands-On series in all subject areas. Jennifer is a former classroom teacher, resource/special education teacher, consultant, and principal. She continues to develop new Hands-On projects, and also serves as a school trustee for the St. James-Assiniboia School Division in Winnipeg, Manitoba.

Rosalind Poon has been a science teacher and Teacher Consultant for Assessment and Literacy with the Richmond School District for the past 18 years. In her current role, she works with school teams to plan and implement various aspects of the curriculum by collaborating with teams in professional inquiry groups on topics such as descriptive feedback, inquiry, assessment, and differentiation. Her passions include her family, dragon boating, cooking with the Instant Pot and making sure that all students have access to great hands-on science experiences.

Deidre Sagert specializes in early years education, and is currently working as the Early Years Support Teacher for the St. James-Assiniboia School Division. She brings 20 years of experience to her current role where she mentors early years teachers in incorporating play-based learning and inquiry into all subject areas. She is passionate about ensuring all students have access to a stimulating environment where they are engaged in hands on experiences and authentic learning. She enjoys spending time with her family in nature for rejuvenation and inspiration.

Melanie Nelson is from the In-SHUCK-ch and Stó:lō Nations, and has experience teaching kindergarten through grade 12, as well as adults in the Lower Mainland of British Columbia. She has taught in mainstream, adapted, modified, and alternate settings, at the classroom, whole school, and district levels. Trained as an educator in science, Melanie approaches Western science through an Indigenous worldview and with Indigenous ways of knowing. Her Master of Arts thesis explored the experience of Indigenous parents who have a child identified as having special needs in school, and she is currently completing a Doctor of Philosophy in School Psychology at the University of British Columbia.

Lisa Schwartz has been a Teacher Consultant for Assessment and Literacy with the Richmond School District for the past six years. As a consultant, Lisa facilitates professional learning with small groups and school staffs on topics such as the redesigned curriculum, Core Competencies, differentiation, inquiry, and assessment. She also works side by side with teachers co-planning, co-teaching and providing demonstration lessons to highlight quality, research-based instruction that supports all learners. Lisa is passionate about engagement, joyful learning and success for all students.

Hetxw'ms Gyetxw (Brett D. Huson) is from the Gitxsan Nation of the Northwest Interior of British Columbia, Canada. Growing up in this strong matrilineal society, Brett developed a passion for the culture, land, and politics of his people, and a desire to share their knowledge and stories. Brett has worked in the film and television industry, and has volunteered for such organizations as Ka Ni Kanichihk and Indigenous Music Manitoba. Brett is the author of the Mothers of Xsan series of children's books. The first book in the series is *The Sockeye Mother*, which won The Science Writers and Communicators Book Award.