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Introduction to

*Hands-On Science, Grade 4*
Introduction to **Hands-On Science**

**Program Introduction**

**Hands-On Science** helps develop students' scientific literacy through active inquiry, problem solving, and decision making. With each activity in the program, 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.

**The Foundations of Scientific Literacy**

**Hands-On Science** focuses on the four foundation statements for scientific literacy in Canada, as outlined in the Pan-Canadian Protocol. These foundation statements are the bases for the learning outcomes identified in **Hands-On Science**.

**Foundation 1: Science, Technology, Society, and the Environment (STSE)**

Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

**Foundation 2: Skills**

Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

**Foundation 3: Knowledge**

Students will construct knowledge and understandings of concepts in life science, physical science, and earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

**Foundation 4: Attitudes**

Students will be encouraged to develop attitudes that support responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

**NOTE:** While these foundation statements form the bases for the science program, it is important for teachers to recognize and honour that some students might identify with science from a cultural knowledge base. For example, Indigenous students might not respond to in-class questioning, as they might view this as opposing traditional protocol of respectful listening; therefore, the teacher may have to clarify the intent of questioning in the classroom and acknowledge the different ways students may demonstrate knowledge, basic skills, values, and attitudes.

**Program Principles**

1. Effective science programs involve hands-on inquiry, problem solving, and decision making.
2. The development of students’ skills, attitudes, knowledge, and understanding of STSE issues form the foundation of the science program.
3. Children have a natural curiosity about science and the world around them. This curiosity must be maintained, fostered, and enhanced through active learning.
4. Science activities must be meaningful, worthwhile, and relate to real-life experiences.

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5. The teacher's role in science education is to facilitate activities and encourage critical thinking and reflection. Children learn best by doing, rather than by just listening. The teacher, therefore, should focus on formulating and asking questions rather than simply telling.

6. Science should be taught in correlation with other school subjects. Themes and topics of study should integrate ideas and skills from several core areas whenever possible.

7. The science program should encompass, and draw on, a wide range of educational resources, including literature, nonfiction research material, audio-visual resources, technology, as well as people and places in the local community.

8. The science program should be infused with knowledge and world-views of the Indigenous Peoples of North America, as well as other diverse multicultural perspectives.

9. Assessment of student learning in science should be designed to focus on performance and understanding, and should be conducted through meaningful assessment techniques carried on throughout the unit of study.

Program Implementation

Program Resources

*Hands-On Science* is organized in a format that makes it easy for teachers to plan and implement. The book is divided into four units, which are the selected topics of study for the grade level, as well as a main introduction at the beginning of the book. The units relate directly to the learning outcomes, which complement those established in the Pan-Canadian Protocol and related provincial/territorial documents.

Each unit also has its own introduction, which summarizes the general goals for the unit. This introduction provides background information for teachers, planning tips, lists of vocabulary related to the unit, as well as other pertinent information such as how to embed technology, sustainability, and Indigenous and multicultural perspectives into units of study.

Also included at the beginning of each unit is a Curriculum Correlation Chart for Knowledge and Understanding Outcomes, and another for Scientific Inquiry and Design Process Skills Outcomes. These are based on the Pan-Canadian Protocol for Science outcomes, as well as on provincial/territorial science curriculum documents.

Additionally, the introduction to each unit includes a list of related books suitable for students and a list of annotated websites. References for Teachers is located at the end of the book.

Each unit is organized into numbered lessons comprised of topics and activities based on the learning outcomes. Lessons are arranged in the following format:

**Lesson Title**: The title of each lesson is posed as a guided inquiry question, which identifies the outcomes students will be addressing or the question they will be answering.

**Information for Teachers**: Some lessons provide teachers with the basic scientific knowledge they will need to present the activities. This information is offered in a clear, concise format, and focuses specifically on the topic of study.

**Materials**: A complete list of materials required to conduct the main activities is provided. The quantity of materials required will depend on how you conduct activities. If students are working individually, you will need enough materials for each student. If students are working in groups, the materials required will...
be significantly reduced. Many of the identified items are for the teacher to use for display purposes, or for making charts for recording students’ ideas. In some cases, visual materials (large pictures, sample charts, and diagrams) have been included with the activity to assist the teacher in presenting ideas and questions, and to encourage discussion. You may wish to reproduce these visuals, mount them on sturdy cardstock, and laminate them so they can be used for years to come.

Engage: This activity is intended to activate prior knowledge, review previous lessons, and engage students in the lesson. The guided inquiry question for the lesson is also introduced in this section. Teachers may choose to record the question for display throughout related investigations. For example, the guided inquiry question might be recorded on a sentence strip and displayed.

Explore: This section details a step-by-step procedure, including higher-level questioning techniques, and suggestions for encouraging the acquisition of new knowledge and skills. In some cases, one lesson may involve several Explore activities, which are identified as Explore: Part One, Explore: Part Two, and so on.

Learning Centre: Included with most lessons are independent student learning opportunities that focus on the learning outcomes. They are designed as learning centres, and to promote differentiated instruction, the centres are based upon multiple intelligences research.\(^2\) Each centre focuses 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. The following intelligences, identified by the accompanying icons, are focused on in *Hands-On Science*:

- **Verbal-Linguistic:** These learners think in words and enjoy reading, writing, word puzzles, and oral storytelling. When a learning centre focuses on Verbal-Linguistic intelligence, the following icon is used:

  \[\text{V-L}\]

- **Logical-Mathematical:** These learners think by reasoning and enjoy problem-solving, puzzles, and working with data. When a learning centre focuses on Logical-Mathematical intelligence, the following icon is used:

  \[\text{L-M}\]

- **Visual-Spatial:** These learners think in visual pictures and enjoy drawing and creating visual designs. When a learning centre focuses on Visual-Spatial intelligence, the following icon is used:

  \[\text{V-S}\]

- **Bodily-Kinesthetic:** These learners think using their physical bodies, and enjoy movement, sports, dance, and hands-on activities. When a learning centre focuses on Bodily-Kinesthetic intelligence, the following icon is used:

  \[\text{B-K}\]

- **Musical-Rhythmic:** These learners think in melodies and rhythms and enjoy singing, listening to music, and creating music. When a learning centre focuses on Musical-Rhythmic intelligence, the following icon is used:

  \[\text{M-R}\]

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- **Interpersonal**: These learners think by talking to others about their ideas and enjoy group work, planning social events, and taking a leadership role with friends or classmates. When a learning centre focuses on Interpersonal intelligence, the following icon is used:

  ![Inter interpersonal icon]

- **Intrapersonal**: These learners think within themselves and enjoy quietly thinking, reflecting, and working individually. When a learning centre focuses on Intrapersonal intelligence, the following icon is used:

  ![Intrapersonal icon]

- **Naturalistic**: These learners learn by classifying objects and events and enjoy anything to do with nature and scientific exploration of natural phenomena. When a learning centre focuses on Naturalistic intelligence, the following icon is used:

  ![Naturalistic icon]

- **Existential**: These learners learn by probing deep philosophical questions and enjoy examining the bigger picture as to why ideas are important. When a learning centre focuses on Existential intelligence, the following icon is used:

  ![Existential icon]

Teachers are encouraged to explore the topic of multiple intelligences with their students and to have students identify ways they learn best, and ways that are challenging for them. Guidelines for this process are included in the book *Teaching to Diversity* (cited in the footnote on the previous page).

Each learning centre is described on a task card that remains at the centre, along with any required supplies and materials. When implementing the learning centres, it is important to review the task card prior to having students work at the centre, to ensure they are familiar with the content and the expectations.

**NOTE**: Many of the learning centre tasks also offer excellent assessment opportunities – both formative and summative – that teachers can take advantage of through student conferences/interviews. Teachers can then use the Individual Student Observations sheet, on page 19, to record assessment data. See the next section of *Hands-On Science, Assessment Plan*, for more information on assessment.

**Embed: Part One**: The activities in this section are intended to review the main ideas of the lesson, focusing on specific learning outcomes. The guided inquiry question for the lesson is also reviewed in this section, and students are encouraged to share their knowledge, provide examples, and ask further inquiry questions. This section also includes directions for any reproducible activity sheets found in the lesson, which are designed to correlate with the learning outcomes of the main activity. Activity sheets are included to be used during the main activity in a lesson, often to record results of investigations. In some lessons, the same activity sheets are used as follow-up to the main activities.

Students may work independently on the sheets, in small groups, or you may read over the sheets together and complete them in a large group setting. Activity sheets can also be made into overheads or large experience charts. Since it is important for students to learn to construct their own charts and recording formats, teachers may decide to use the activity sheets as examples of ways to record and communicate ideas about an activity. Students can then create their own sheets rather than use the ones provided.
NOTE: Activity sheets are meant to be used only in conjunction with, or as a follow-up to, the hands-on activities. The activity sheets are not intended to be the science lesson in itself or the sole assessment for the lesson.

Embed: Part Two: With each lesson, teachers are also encouraged to embed learning by adding to graphic organizers; having students record, describe, and illustrate new vocabulary; and adding new vocabulary to the classroom word wall (a bulletin board or piece of poster paper for displaying new science terminology. Both teachers and students can then add to the word wall throughout the unit, or even all year.) New vocabulary may include terminology in Indigenous and other languages that reflect the cultural diversity of the classroom and the community.

Enhance: This section includes optional activities to extend, enrich, and reinforce the learning outcomes. Many lessons can be enhanced with interactive whiteboard activities, available through Portage & Main Press’s website. For directions on how to access an activity, check the Enhance section of each lesson. Activities can be used on interactive whiteboards and on computers and/or tablets.

Assessment for, as, and of Learning: Based on current research about the value of quality classroom assessment (Davies 2011), suggestions are provided for authentic assessment, which includes assessment for learning, assessment as learning, and assessment of learning. These assessment strategies focus specifically on the learning outcomes that are related to a particular lesson.

Keep in mind that these suggestions are merely ideas to consider; teachers are also encouraged to use their own assessment techniques and to refer to the other assessment strategies outlined in detail in the Assessment section of Hands-On Science, on pages 15 to 28.

Classroom Environment

The classroom setting is an important aspect of any learning process. An active environment, one that gently hums with the purposeful conversations and activities of students, indicates that meaningful learning is taking place. When studying a specific topic, teachers are encouraged to display related objects and materials, student work, pictures and posters, graphs and charts made during activities, and summary charts of important concepts taught and learned. An active environment reinforces concepts and skills that have been stressed during science activities.

Timelines

No two groups of students will cover topics and material at the same rate, and so planning the duration of units is an important responsibility of the teacher. In some cases, students will not complete the lesson’s activities during one block of time, and students may be especially interested in one topic and want to expand upon it. The individual needs of the class should be considered; there are no strict timelines involved in Hands-On Science. It is important, however, to spend time on every unit in the program so that students focus on all the curriculum outcomes established for the grade level.

Classroom Management

Although hands-on activities are emphasized throughout this program, how these experiences are handled is up to the individual teacher. In some cases, teachers may have all students manipulating materials individually; in others, teachers may choose to organize the class into small group settings. Small groups encourage the development of social skills, enable all students to be active in the learning process, and mean less cost in terms of materials and equipment.
Classroom Safety

Occasionally, especially when safety concerns are an issue, teachers may decide to demonstrate an activity, while still encouraging as much student interaction as possible. Again, classroom management is up to the individual teacher, since it is the teacher who ultimately determines how the students in his or her care function best in the learning environment.

The nature of science and of scientific experimentation means that safety concerns do arise from time to time. Throughout Hands-On Science, when there is a potential safety issue that teachers need to be aware of, the concern is flagged with the following safety icon:

⚠️

Scientific Inquiry Skills: Guidelines for Teachers

The Hands-On Science program is based upon a scientific inquiry approach. While involved in the activities of Hands-On Science, students use a variety of scientific inquiry skills as they answer questions, solve problems, and make decisions. These skills are not unique to science, but they are integral to students’ acquisition of scientific literacy. The skills include initiating and planning, performing and recording, analyzing and interpreting, as well as communicating and the ability to work in teams. In the early years, basic skills should focus on scientific inquiry and design.

The following guidelines provide a framework that can be used to encourage students’ skill development in specific areas.

Observing

Students learn to perceive characteristics and changes through the use of all five senses. Students are encouraged to use sight, smell, touch, hearing, and taste safely, in order to gain information about objects and events. Observations may be qualitative (by describing properties such as texture or colour), or quantitative (such as size or number), or both. Observing includes:

- gaining information through the senses
- identifying similarities and differences, and making comparisons

It is important to encourage students to communicate their observations in a variety of ways, including orally, in writing, and by sketching labelled diagrams.

Exploring

Students need ample opportunities to manipulate materials and equipment in order to discover and learn new ideas and concepts. During exploration, students need to be encouraged to use all of their senses and observation skills. Oral discussion is also an integral component of exploration; it allows students to communicate their discoveries.

Classifying

Classification is used to group or sort objects and events and is based on observable properties. For example, rocks can be classified as igneous, metamorphic, and sedimentary. One strategy for sorting involves the use of a sorting mat or Venn diagram. Sorting mats show distinct groups, while Venn diagrams intersect to show similar characteristics among sets.
For example:

**Measuring**

Measuring is a process of discovering the dimensions or the quantity of objects or events. In the early years, measuring activities first involve the use of nonstandard units of measure, such as interlocking cubes or paper clips to determine length. This allows students to build understanding of how to observe, compare, and communicate dimensions and quantity. This is a critical preface to measuring with standard units. By grade 4, students use standard measuring tools. For example, they will measure mass/weight, length, volume, and temperature using standards units. They will also measure the passage of time using seconds, minutes, and hours.

An essential skill of measurement is estimating. Students should be encouraged regularly to estimate before they measure, whether in nonstandard or standard units. Estimation allows students opportunities to take risks, use background knowledge, and learn from the process.

**Communicating, Analyzing, and Interpreting**

In science, one communicates by means of diagrams, graphs, charts, maps, models, and symbols, as well as with written and spoken languages. Communicating includes:

- reading and interpreting data from tables and charts
- making tables and charts
- reading and interpreting data from pictographs and bar graphs
- making pictographs and bar graphs
- making labelled diagrams
- making models
- using oral and written language
- sequencing and grouping events, objects, and data according to attributes

When presenting students with charts and graphs, or when students make their own as part of a specific activity, there are guidelines that should be followed:
A tally chart is a means of recording data as an organized count. The count is grouped in 5s for ease of determining the total by counting by 5s.

<table>
<thead>
<tr>
<th>Favourite Sport</th>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soccer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A pictograph has a title and information on one axis that denote the items being compared (note that the first letter on both the title and the axis text is capitalized). There is generally no graduated scale or heading for the axis representing numerical values.

A bar graph is another common form of scientific communication. Bar graphs should always be titled so the information communicated is easily understood. These titles should be capitalized in the same manner as one would title a story. Both axes of the graph should also be titled and capitalized in the same way. In most cases, graduated markings are noted on one axis and the objects or events being compared are noted on the other. On a bar graph, the bars must be separate, as each bar represents a distinct piece of data.

By grade 4, students should also be constructing pictographs and bar graphs using many-to-one correspondence, as in the example below:

<table>
<thead>
<tr>
<th>Number of Birds Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeremy</td>
</tr>
<tr>
<td>Judy</td>
</tr>
<tr>
<td>David</td>
</tr>
<tr>
<td>Kelly</td>
</tr>
<tr>
<td>Emily</td>
</tr>
</tbody>
</table>

Each stand for 5 birds.

A chart (table) requires an appropriate title, and both columns and rows need specific headings. Again, all titles and headings require capitalization of the first letter as in the title of a story. In some cases, pictures can be used to make the chart easier for young students to understand. Charts can be made in the form of checklists or can include room for additional written information and data.
Communicating also involves using the language and terminology of science. Teachers should encourage students to use the appropriate vocabulary related to their investigations (e.g., object, metal, pliable, absorbent, and characteristic). The language of science also includes terms such as predict, infer, estimate, measure, experiment, and hypothesize. Teachers should use this vocabulary regularly throughout all activities and encourage their students to do the same. As students become proficient at reading and writing, they can also be encouraged to use the vocabulary in written form. Consider developing whole-class or individual student glossaries in which students can record the terms they have learned and define them in their own words.

**Predicting**

Predicting refers to the question, “What do you think will happen?” For example, ask students to predict what they think will happen to a blown-up balloon that is placed in a basin of water. It is important to provide opportunities for students to make predictions and for them to feel safe doing so.

**Inferring**

In a scientific context, inferring generally refers to asking why something occurs. For example, ask students to infer why a blown-up balloon floats when placed into a basin of water. Again, it is important to encourage students to take risks when making such inferences. Before explaining scientific phenomena to them, they should be given opportunities to infer for themselves, using a variety of perspectives.

**Inquiry Through Investigating and Experimenting**

When investigations and experiments are conducted in the classroom, planning and recording both the process and the results are essential. There are standard guidelines for leading these hands-on inquiries:

- **Purpose:** what we want to find out, or a testable question we want to answer
- **Hypothesis:** a prediction; what we think will happen, and why
- **Materials:** what we used to conduct the experiment or investigation
- **Method:** what we did
- **Results:** what we observed and measured
- **Conclusion:** what we found out
- **Application:** how we can use what we learned

Both the purpose and the hypothesis should be in present tense, as these are determined by students prior to the hands-on experiment. In *Hands-On Science* lessons, there are often investigations that can be explored using this version of the standard experimental design.
Throughout the inquiry process, it is important that students be guided through these steps, and be given the opportunity to communicate their questions, predictions, observations, and conclusions. This may be done in a variety of ways: orally as a class, recording findings as a class, having students use drawings and writings, or a combination of these.

**Inquiry Through Research**

Research is another aspect of inquiry that involves finding, organizing, and presenting information related to a specific topic or question. Scientific inquiry involves making observations, exploring, asking questions, and looking for answers to those questions. Even at a young age, students can begin to research topics studied in class if they are provided with support and guidelines. Accordingly, guided research is a teaching/learning strategy that is encouraged throughout *Hands-On Science*. Guided research provides an opportunity for students to seek further information about subjects of inquiry, personal interest, or topics of their choice. As such, students are empowered and engaged in the process. Guided research encourages students to:

- Ask questions of interest related to a topic being studied by the class.
- Choose resources.
- Collect information.
- Make a plan to present findings.
- Present research in a variety of ways.

Guided research encourages teachers to:

- Provide opportunities for students to ask questions of personal interest.
- Provide accessibility to appropriate resources.
- Model and support the research process.
- Offer opportunities for students to present their findings in a variety of ways and to a variety of audiences.

In *Hands-On Science*, the approach for scientific inquiry is one of gradual release. The teacher provides substantial support in initial inquiry experiences, and gradually presents students with more and more opportunities for directing their own research. Suggestions for guiding research are presented regularly throughout *Hands-On Science*.

**Online Considerations**

As our technological world continues to expand at an accelerating rate, and increasing information is available online, students will turn to the Internet more and more to expand their learning. Accordingly, *Hands on Science, Grade 4* is replete with opportunities for students to research and investigate using online resources.

Teachers are encouraged to talk often with students about safety protocols when online. Particularly when students are using the Internet to make connections with other people (for example, in search of information about a topic they are exploring), it is important they are fully aware of how to keep themselves safe when connecting with strangers. At all times, teachers should be vigilant in supervising student use of the Internet.

Teachers are also encouraged to discuss copyright and plagiarism with regards to the Internet, reminding students that copying information word for word is wrong. If they are quoting information from the Internet, quotation marks are required, along with appropriate citation of the source. Otherwise, information should always be paraphrased. Photos, drawings, figures, and other images found online should also be used only with permission and citation of the source. Alternatively, students can source images for which permission has already been granted for use, such as through Creative Commons Canada (a nonprofit organization that “promotes and enables the sharing of...
knowledge and creativity…[and which] produces and maintains a free suite of licensing tools to allow anyone to easily share, reuse, and remix materials with a fair ‘some rights reserved’ approach to copyright.” See <http://creativecommons.ca>.

**Addressing Students’ Early Literacy Needs**

The inquiry process involves having students ask questions, and conduct investigations and research to answer these questions. At the grade-4 level, students may benefit from support for research, reading, and writing. Consider having volunteers, student mentors, or educational-assistants support students during these processes to help students with reading, research, and writing.

**Using the Design Process**

Throughout *Hands-On Science*, students have opportunities to use the design process to plan (design) and construct objects. For example, in Unit 1, students design and construct a feeder for a local animal.

The design process involves having students seek solutions to practical problems. There are specific steps to the process:

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 in writing and using labelled diagrams.
3. Develop a product: 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.

The design process also involves research and experimentation.

When the design process is featured in a lesson of *Hands-On Science*, the following icon is used:

![Design Process Icon]

**Developing Attitudes Related to Science, Technology, and Society**


Attitudes refer to generalized aspects of behaviour that are modelled for students and reinforced by selective approval. Attitudes are not acquired in the same way as skills and knowledge. They cannot be observed at any particular moment, but are evidenced by regular, unprompted manifestations over time. Development of attitudes is a lifelong process that involves the home, the school, the community, and society at large. The development of positive attitudes plays an important role in students’ growth by interacting with their intellectual development and by creating a readiness for responsible application of what they learn (p. 2.10).

The science-, technology-, and society-related attitudes focused on at the grade-4 level and which are fostered and encouraged throughout *Hands-On Science* lessons include:

- Recognize experimental results may vary slightly when carried out by different persons, or at different times or places; but if the results of repeated experiments are very different, something must be wrong with the design of the experiment.
- Recognize scientists must support their explanations using evidence and scientific knowledge.
■ Recognize designing a solution to a simple problem may have considerations, such as cost, materials, time, and space.
■ Respect alternative views of the world.
■ Demonstrate confidence in their ability to do science.
■ Report and record what is observed, not what they think they ought to observe, nor what they believe the teacher expects.

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. Throughout the Hands-On Science program, suggestions are made for connecting science topics to cultural explorations and activities.

Indigenous Connections
As the original human inhabitants of Canada, Indigenous peoples are central to the Canadian context. As such, it is important to infuse the knowledge of our Indigenous forebears and their descendants into the learning experiences of all students. There are three groups of Indigenous peoples in Canada: First Nations, Métis, and Inuit.

Throughout the Hands-On Science program, there are many opportunities to incorporate culturally appropriate teaching methodologies from an Indigenous world-view. As one example, Indigenous Elders offer a wealth of knowledge that can be shared with students. Consider inviting an Elder as a guest into the classroom in connection with specific topics being studied (as identified within the given lessons throughout the unit). An Elder can guide a nature walk, share stories and legends, and help students understand an Indigenous perspective of the natural world. An Elder will provide guidance for learners and opportunities to build bridges between the school and the community.

It is important to acknowledge any visiting (or visited) Elder, as Elders have traditionally been recognized within Indigenous communities as highly esteemed individuals. There are certain protocols that should be followed when inviting an Elder into your classroom: “TPAC Elder Protocol – Policies and Procedures” is a document from the University of Manitoba Student Affairs Aboriginal Student Centre that includes helpful information in this regard. See: <www.umanitoba.ca/student/asc/tpac/protocol.html>.

NOTE: Although both cultural connections and Indigenous connections are generally included in the Enhance section of a lesson of Hands-On Science, teachers should not regard this content as supplementary. First and foremost, the central science outcomes are focused on in the Engage and Explore sections of each lesson, while other curricular connections – such as literature, art, Indigenous connections, and other cultural connections – are usually featured in the Enhance section.

Technology
Digital learning, or learning with information and communication technology (LwICT), is an important component of any classroom. As such, technological supports available in schools – including digital cameras, computers/tablets, interactive whiteboards (IWB), projectors, document cameras, and even
calculators – can be used with and by students to enhance their learning experiences. When technology connections are made in Hands-On Science lessons, the following icon is used:

Sustainability

Hands-On Science provides numerous opportunities for students to investigate issues related to sustainable development. Asking students the following question can often help to clarify for them what is meant by sustainability: “Is there enough for everyone, forever?” Exploring sustainability also connects to the Indigenous world-view about respecting and caring for the earth.

The three pillars of sustainability are the environment, society, and the economy. When sustainability links are made in Hands-On Science lessons, any or all of the sustainability pillars may be the focus of this connection, and are identified by the following icon:
The Hands-On Science Assessment Plan

Hands-On Science provides a variety of assessment tools that enables teachers to build a comprehensive and authentic daily assessment plan for their students. Based on current research about the value of quality classroom assessment (Davies 2011), suggestions are provided for authentic assessment for learning, assessment as learning, and assessment of learning:

Assessment for Learning

It is important to assess student understanding before, during, and after a science lesson. The information gathered helps teachers determine students’ needs and then plan the next steps in instruction. Students may come into class with misconceptions about science concepts. By identifying what they already know, you can help them make connections and address any problem areas.

To assess students as they work, use the assessment for learning suggestions and questions provided with many of the activities. Questions focus on the lesson outcomes and are intended to promote higher-level thinking skills, active inquiry, and decision making.

While observing and conversing with students, use the Anecdotal Record sheet, as well as the Individual Student Observations sheet to record assessment for learning data:

- Anecdotal Record: To gain an authentic view of a student’s progress, it is critical to record observations during science activities. The Anecdotal Record sheet, presented on page 18, provides the teacher with a format for recording individual or group observations.

- Individual Student Observations: When teachers wish to focus more on individual students for a longer period of time, consider using the Individual Student

Observations sheet, found on page 19. This reproducible provides more space for comments and is especially useful during conferencing, interviews, or individual student performance tasks.

When assessment for learning is suggested in a lesson, the icon shown at left is used.

Assessment as Learning

It is also important for students to reflect on their own learning about science. For this purpose, teachers will find a Student Self-Assessment sheet on page 25.

NOTE: This reproducible requires students to describe a science skill on which they are working. This offers a valuable opportunity to discuss with students the scientific inquiry skills emphasized in grade 4, and to encourage a focus on these skills during all science activities. Refer to the description of these skills in the subsection of the introduction, Scientific Inquiry Skills: Guidelines for Teachers (pages 7–10), as well as to the Curriculum Correlation Chart: Scientific Inquiry and Design Process Outcomes, at the beginning of each unit.

In addition, a Science Journal sheet, found on page 20, will encourage students to reflect on their own learning. Teachers can copy several sheets for each student, cut them in half, add a cover, and bind the sheets together. Students can then create title pages for their own journals. For variety, you may also have students use the blank reverse sides of each page for other reflections. For example, have students draw or write about:

- new science challenges
- favourite science activities
- real-life experiences with science
- new science terminology

Assessment Plan 15
Students should also be encouraged to reflect on their cooperative group work skills. For this purpose, a Cooperative Skills Self-Assessment rubric is included on page 26.

Student reflections can also be done in many ways other than in writing. For example, students can:

- Interview one another to share their reflections on science.
- Write an outline or brief script, and make a video reflection.
- Create an electronic slide show with an audio recording of their reflections.

When assessment as learning is suggested in a lesson, the icon shown on the preceding page is used.

**Assessment of Learning**

Assessment of learning provides a summary of student progress related to the accomplishment of the outcomes at a particular point in time. It is important to gather a variety of assessment data to draw conclusions about what a student knows and can do. As such, consider collecting student products, observing processes, and having conversations with students. Teachers should also consider which student work is formative and which is summative in their deliberations. Only the most recent and consistent evidence should be used.

Assessment of learning suggestions are provided throughout the *Hands-On Science* program. Use the Anecdotal Record sheet, found on page 18, and the Individual Student Observations sheet, found on page 19, to record student results.

Always assess the individual student’s accomplishments, not group work. However, you may also assess how the individual student works within a group. Such skill development includes the ability to “respond respectfully to the ideas and actions of others … assume roles and share responsibilities as group members … listen to and consider differing opinions.”

For this purpose, a Cooperative Skills Teacher Assessment form is included on page 24.

When assessment of learning is suggested in a lesson, the icon shown in the preceding column is used.

**Performance Assessment**

Assessment of learning also includes performance assessment, which is planned, systematic observation and assessment based on students actually doing a specific science activity. Teacher- or teacher/student-created rubrics can be used to assess student performance.

A Sample Rubric and a Rubric for teacher use are included on pages 21 and 22. For any specific activity, the teacher and students discuss criteria for completing a task successfully before the work is done. The teacher then selects four criteria that relate directly to the learning outcomes, and records these criteria on the Rubric. Students receive a check mark point for each criterion accomplished to determine a rubric score from a total of four marks. These rubric scores can then be transferred to the Rubric Class Record form found on page 23.

**NOTE:** Performance tasks can be used for both assessment for learning and assessment of learning.

Consider using four levels of achievement for your rubrics, to determine performance levels:

3  Manitoba Education and Training, 1999, p.3.37
4. Thorough understanding and in-depth application of concepts and skills
3. Very good understanding and application of concepts and skills
2. Basic understanding and some application of concepts and skills
1. Limited understanding and minimal application of concepts and skills

*Hands-On Science* provides numerous opportunities for students to apply their skills. By considering the same levels throughout the year, you should be able to track skill development and determine when students have a thorough understanding and in-depth application of concepts and skills.

**Portfolios**

A portfolio is a collection of work that shows evidence of a student’s learning. There are many types of portfolios; the showcase portfolio and the progress portfolio are two popular formats. Showcase portfolios highlight the best of the students’ work, with students involved in the selection of pieces and justification for choices. Progress portfolios reflect the students’ progress as they improve, and aim to demonstrate an in-depth understanding of the material over time.

Select, with student input, work to include in a science portfolio or in a science section of a multi-subject portfolio. This should include representative samples of student work in all types of science activities. Reproducibles are included to organize the portfolio (*Portfolio Table of Contents* sheet is on page 27, and *Portfolio Entry Record* sheets are on page 28).

**NOTE:** In an Indigenous context, portfolio creation may differ in that the student and teacher may select completed work from a coming-to-know perspective that reflects participatory learning. Students reflect on their own understanding of the world around them or a sense of negotiating another point of view.

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**An Important Note to Teachers**

Throughout the *Hands-On Science* program, suggestions are provided for assessment for learning, assessment as learning, and assessment of learning. It is important to keep in mind that these are merely suggestions. Teachers are encouraged to use the assessment strategies presented in a wide variety of ways, and to ensure that they build an effective assessment plan using these assessment ideas, as well as their own valuable experience as educators.

**NOTE:** From an Indigenous perspective, assessment is community-based, qualitative, and holistic, and includes input from all the people who influence an individual student’s learning – parents, caregivers, Elders, community members, and educators. An assessment that includes all these perspectives provides a balanced understanding of what represents success for Indigenous students and their families/community. A strong partnership between parents/guardians/communities and school improves student achievement. Teachers should be aware some Indigenous students may feel apprehensive about a formal process of assessment; others may find Western achievement goals do not fit their Indigenous world-view.

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Unit 1

Habitats and Communities
Introduction

In this unit of *Hands-On Science, Grade 4*, students become familiar with the basic needs of plants and animals. Throughout the unit they investigate the concepts of habitat and community, and they explore and compare ways in which communities of plants and animals meet their needs in specific habitats. Through investigation, they also identify factors that can affect habitats and communities of plants and animals.

Additionally, students explore both the dependency of plants and animals on their habitats and the interrelationships of plants and animals living in a specific habitat. As well, students describe ways humans can change habitats and the effects these changes have on the living things within the habitats.

Planning Tips for Teachers

- There is no better way to motivate students to learn about animals than having a live animal in the classroom. Students will find all concepts and objectives within this unit more meaningful if they have an animal to observe and care for. Many animals are relatively easy to look after and, therefore, are suitable for the classroom. Fish, for example, are easily cared for, and a fish tank provides an excellent observation centre for students. Guinea pigs are one of the best animals for the classroom, as they are large enough for students to handle, not fast enough to escape, and usually gentle and affectionate. To introduce a greater variety of animals to students, teachers may also choose to have guest pets (e.g., bird, rabbit, gerbil, snake) visit the classroom for a month at a time.

SAFETY NOTE: Teachers should carefully review any student allergies in the class before selecting a classroom animal. An allergy to an animal should not, however, prevent educators from introducing another suitable animal to the class.

- Teachers need to be aware of the ethics and legalities of having live plants and animals in the classroom, and of using biological tissues such as owl pellets. A helpful new resource, *Science and Safety: A Kindergarten to Grade 12 Resource Manual for Teachers, Schools, and School Divisions* (Manitoba Education and Advanced Learning), is available at: <www.edu.gov.mb.ca/k12/docs/support/scisafe>.

- To provide students with hands-on experiences during their exploration of the concepts in this unit, teachers need to have live plants in the classroom. Collect a variety of plants that students can care for. Also, obtain seeds, and plant them so students can observe population growth. Plant slips may also be brought from home to start new plants.

- Teachers will need a variety of pictures, books, and videos depicting plant and animal populations, habitats, and relationships within environmental communities. Involve students in this project. Good sources for photographs and drawings include:
  - old calendars
  - magazines, particularly *Ranger Rick, Owl, Chickadee, Highlights for Children, Canadian Geographic, and National Geographic*
  - gardening magazines
  - seed catalogues
  - departments of agriculture
  - forestry and environmental associations
  - Greenpeace
  - local zoological, wildlife, humane/animal-protection, and naturalist organizations/societies
  - government conservation departments and local water/wildlife conservation associations (e.g., Manitoba Conservation Districts Association)
NOTE: If contacted in advance, many organizations will provide booklets, posters, and other useful information. Some may also provide kits or presentations for classrooms.

- Organize a collection of fiction and nonfiction books about animals and plants. Keep these in a separate part of the classroom library or at the plant and animal centres, where they can be referred to during activities, research, and free times.
- Lesson 3 includes a visit to a local habitat with a variety of plant and animal populations. Choose an area easily accessible to the school, and pre-arrange this early. Suggested local habitats include parks, streams, wildlife areas, forests, prairies, and so on.
- Lesson 4 includes a learning-centre activity that requires preplanning, as it involves planting and sprouting seeds. Consider using grass seed, radish seeds, and marigolds. Spread the seeds densely throughout the soil, and water them regularly with a spray bottle. Do not thin them out as they begin to sprout.

NOTE: Teachers may also want to consider involving students in the seed sprouting and planting, to engage them with anticipation for the lessons to come.

This unit of *Hands-On Science, Grade 4* provides an opportunity to explore Indigenous world-views about nature, including having a respectful relationship with plants and animals, the interconnected relationship humans share with animals, and a human reliance on animals and plants for sustenance.

Indigenous peoples believe all life – plants, animals, and humans – are equals, and all living things are dependent upon one another for survival. When an animal is hunted, every part of it is used for food, clothing, tools, and/or shelter. It is believed the animal gives up its soul to provide humans with what they need for survival; therefore, out of respect, no part of the sacrificed animal should wasted.

Traditionally, Indigenous peoples’ existence was dependent upon animals for everything – signalling seasonal changes, assisting with agricultural pursuits, and for transportation, shelter, clothing, and, of course, food. With a true appreciation of where their food comes from, Indigenous peoples traditionally have in-depth knowledge about hunting, as well as about the animals they hunt. They have developed relationships with the animals, which they regard as teachers, guides, and companions, in addition to being integral to their survival.

Traditional ecological knowledge (TEK) refers to traditional knowledge regarding sustainability of local resources for generations to come and the relationship of living beings with their environment. TEK is based on a cumulative body of knowledge, beliefs, and practices handed down from generation to generation through traditional songs, stories, and oral teachings.

**Science Vocabulary**

Throughout this unit of *Hands-On Science, Grade 4*, teachers should use, and encourage students to use, vocabulary such as:

- adaptation, behavioural adaptation, carnivore, community, conservation, consumer, endangered, extinct, food chain, food web, habitat, herbivore, omnivore, organism, physical adaptation, population, predator, prey, producer, scavenger, technological development, traditional knowledge.

Teachers should also consider using, and encouraging students to use, vocabulary related to scientific inquiry skills. This vocabulary can be
displayed in the classroom throughout the year, as it relates to all science clusters. Teachers and students can then brainstorm which skills they are being asked to use as they work in particular lessons. They can also discuss how the skill looks and sounds as they explore and investigate. Vocabulary related to scientific inquiry skills includes:

- access, ask, brainstorm, collect, compare, connect, consider, construct, cooperate, create, describe, develop, estimate, explain, explore, find, follow, graph, identify, improve, investigate, measure, observe, order, plan, predict, recognize, record, repeat, research, respond, select, sequence, test.

Throughout the unit, a science glossary is referred to, as well as a class word wall. The word wall can be created on a bulletin board or simply on a piece of poster paper, so as not to take up too much space. On the bulletin board or poster paper, record new vocabulary as it is introduced throughout the unit. Ensure the word wall is placed in a location where all students can see and access the words.
How Do Plants and Animals Adapt to Survive in Their Environment?

Information for Teachers

Adaptations allow plants and animals to survive in their habitat. There are two types of adaptations: structural and behavioural.

Structural adaptations include physical features that protect the organism, help it get its food, or help it to move. For example, a hawk has a hooked beak that can rip and tear food, and a sparrow has a short, pointed beak that can crack open seeds. Water birds have flat beaks that allow them to scoop food from the water. Body colour is another form of adaptation that protects animals through camouflage.

Behavioural adaptations exist because such actions help an organism survive in a given habitat. Migration, birdcalls, and mating rituals are three examples of behavioural adaptations.

In order to study adaptations, information is provided on the characteristics of various types of bears. Further information can be gathered through research as a class.

Polar Bears
- long, slender necks; slender heads; white fur, black skin (absorbs heat from the sun)
- live in the Arctic (mostly on polar ice)
- feed on fish and seals
- thick fur (for keeping warm)
- webbing between toes (for swimming)

Grizzly Bears
- long claws (for digging up most of their food)
- distinctive hump between shoulders
- eat roots, gophers, smaller rodents, and occasionally kill larger animals for food
- live on edges of forest
- feed mostly in mountain meadows

Black Bears
- short claws
- live in a variety of habitats (forest, brush, or chaparral)
- eat mostly nuts, berries, fruit, rodents, insects; occasionally kill larger animals for food
- smaller than polar and grizzly bears, with pointier heads

Materials
- books about polar bears, grizzly bears, and black bears
- Internet content related to bears (e.g., “How do you distinguish a black bear from a grizzly bear?” on the MountainNature website at: <www.mountainnature.com/wildlife/bears/bearid.htm>)
- pictures of polar bears, grizzly bears, and black bears (Make several copies of the pictures.)
- chart paper
- markers
- computers/tablets with Internet access
- student dictionaries (Internet or print)
- print and Internet resources about a variety of plants and animals in different habitats
- mural paper
- construction paper
- art supplies (e.g., Plasticine, cardboard, shoeboxes, pipe cleaners, scissors, pastels, crayons, markers, glue or tape)
- natural materials (e.g., leaves, twigs, stones)
- Activity Sheet A: Investigating Bears (1.5.1)
- Activity Sheet B: Video Viewing Guide (1.5.2)
- Activity Sheet C: Adaptations (1.5.3)
- Learning-Centre Task Card: How Is Camouflage a Structural Adaptation? (1.5.4)
- KWHL chart (from lesson 1)
- Science Glossary (1.1.4)
Engage
Divide the class into working groups. Provide each group with copies of the three pictures of bear species. Have students examine and discuss the pictures, looking for similarities and differences among the three bears.

On chart paper, draw a triple intersecting Venn diagram, as in the following example:

```
Polar Bear  Grizzly Bear
              Black Bear
```

Model how to present similarities and differences on a Venn diagram. Ask:

■ What is one way all three types of bears are similar?

Record one idea in the very centre section of the Venn diagram, where all circles intersect (e.g., four legs). Ask:

■ What is one way the polar bear is different from the other two bears?

Record one idea in the appropriate section of the Venn (e.g., webbing between toes).

Once students are confident with the process, distribute a sheet of chart paper and marker to each group. Have each group draw a triple-intersecting Venn diagram on the chart paper, using the class Venn as a model. In their groups, have students record similarities and differences among the three bears.

Provide an opportunity for each group to present its findings, and discuss as a class.

Next, introduce the idea of adaptations. Ask:

■ Why do you think the three species of bears have different characteristics?

Have students share their ideas.

Introduce the guided inquiry question: How do plants and animals adapt to survive in their environment?

Explore: Part One

Provide an opportunity for students to research the physical characteristics of each bear, as well as information about each bear’s habitat. Provide a copy of Activity Sheet A: Investigating Bears (1.5.1) to each student, and have students use print and Internet references to complete the sheet.

Once students have completed their research, discuss their findings as a class. Ask:

■ Think about how each bear looks. How do the bear's physical characteristics help it survive where it lives?

■ Think about what each bear eats. Why does it eat this food? What physical characteristics of each bear help it get the food it eats?

■ What are a grizzly bear's needs? How does a grizzly bear meet its needs in its habitat?

■ What are a polar bear's needs? How does a polar bear meet its needs in its habitat?

■ What are a black bear's needs? How does a black bear meet its needs in its habitat?

■ If you moved polar bears to a national park in central Canada and you moved grizzly bears to the Arctic coast, do you think the bears would be able to survive in their new homes? Why or why not?

Explain to students that these bears have adapted to their environment in order to survive.
All plants and animals need to make some adaptations to the environments in which they live in order to survive.

Record the term adaptation on chart paper. Have students share their background knowledge and ideas about the definition of the term. Record their suggestions, and determine a class definition for adaptation. Compare the class definition to Internet or student dictionaries to confirm accuracy.

**Activity Sheet A**

Directions to students:
As you research bears, draw illustrations of a grizzly bear, a black bear, and a polar bear. Provide a physical description of each bear and a description of its habitat (1.5.1).

**Explore: Part Two**

Show students the NatureWorks video, *Adaptation* (<http://video.nhptv.org/video/1492015101/>), which focuses on adaptations of various animals and plants, distinguishing between structural and behavioural adaptations. Provide each student with a copy of Activity Sheet B: Video Viewing Guide (1.5.2), and have students complete the sheet while they view the video.

**Activity Sheet B**

Directions to students:
As you watch the video, *Adaptation*, complete the three categories on the sheet (1.5.2).

Next, create a Carroll diagram on chart paper, as in the following example:

<table>
<thead>
<tr>
<th>Animal</th>
<th>Structural Adaptation</th>
<th>Behavioural Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opossum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Porcupine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owl</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As a class, complete the Carroll diagram for several animals, distinguishing between structural and behavioural adaptations.

**Explore: Part Three**

Divide the class into working groups, and provide each group with chart paper, markers, copies of Activity Sheet C: Adaptations (1.5.3), and print and Internet references about a variety of plants and animals in different environments. Have the groups explore the resources to identify ways animals and plants have adapted to their habitats. Examples may include:

- The snowshoe rabbit has a white coat in winter and a tan coat in summer.
- Chameleons change colour to blend in with their surroundings.
- Geese fly south in the winter.
- Cacti have fleshy stems to hold water during periods of drought.
- Black bears hibernate to escape the cold of winter.
- The nesting killdeer bird fakes a broken wing to keep predators away from its nest.
- Desert animals are active at night to escape the heat of day.
- The height of a plant depends on the amount of sunlight it needs and gets.
- A walking stick insect looks like a twig or stick.

Have each group present its findings to the class.

Now, focus on adaptations that are examples of camouflage. Ask students:

- What is the term for using colour to hide in one's environment?
- Which animals use camouflage?
- How do humans use camouflage? (e.g., in the military, soldiers wear camouflage clothing to hide from enemies)
Display students’ charts in the classroom, and encourage them to add to the list of adaptations throughout the unit. Have students complete the activity sheet.

**Activity Sheet C**

Directions to students:

On the chart, record examples of how animals and plants adapt to survive in their environment (1.5.3).

**Explore: Part Four**

As a class, investigate ways that technological developments mirror physical adaptations. Create a display for the classroom that illustrates this. For example:

- Scuba fins are similar to a duck’s webbed feet.
- A fishing net is similar to a spider’s web.
- An airplane is designed similar to the body of a bird.
- A canoe is shaped much like a fish’s streamlined body.
- Military uniforms camouflage soldiers to protect them from enemies.

Have students collect human-made objects that reflect structural adaptations from nature. For each object, include pictures of the organism after which the object has been modelled.

**Learning Centre**

At the learning centre, provide a variety of print materials related to animals, as well as shoeboxes, Plasticine, paper, cardboard, pipe cleaners, paint, crayons, markers, natural materials (e.g., leaves, twigs, stones), along with glue, tape, and a copy of the Learning-Centre Task Card: How Is Camouflage a Structural Adaptation? (1.5.4).

Tell students their challenge is to make animals from Plasticine, and then create dioramas/environments that camouflage at least one type of animal. Prior to visiting the learning centre, have students meet as a class and co-construct criteria for the project. For example, the diorama should:

- represent a specific local or regional habitat
- represent at least three plant populations within that habitat
- represent at least three animal populations within that habitat
- camouflage at least one animal

**Embed: Part One**

Revisit the guided inquiry question: How do plants and animals adapt to survive in their environment? Have students share their knowledge, 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.
- Add new terms, including *adapt, adaptation,* and *camouflage,* and illustrations to the class word wall. Also, include the words in other languages, as appropriate.
- Have students add new terms, illustrations, and definitions to their Science Glossary (1.1.4). When possible, encourage them to add the words in other languages, including Indigenous languages, reflective of the classroom population.

**Enhance**

- Once students have constructed their camouflage dioramas at the learning centre, have them challenge other students to find any animals hidden in the environments.
Return to a discussion about bears. Consider why nuisance bears are trapped and must be taken long distances away from where they are found. If the bears are not taken far away, they will return to the original location (for food, shelter, and so on), because they have become habitualized to the readily available food sources.

Have students use software such as Comic Life to create animations to show behavioural adaptations in animals.

Investigate alternate explanations of plant and animal adaptations based on traditional knowledge from a variety of cultures. For example, read Indigenous legends that explain how animals and plants got their unique features. After reading stories from several cultures, have students write their own legends. Examples may include:

- How the skunk got its stripe.
- How the giraffe got its long neck.
- How the fox got its bushy tail.
- Why the polar bear is white.
- How the cactus got its needles.
- How the porcupine got its needles.
- Why the sunflower turns to the sun.

**NOTE:** The book *Keepers of the Animals* by Michael J. Caduto is an excellent resource to read with students for this project.

Have students identify human designs that reflect things in nature. Then, ask them to fold a piece of art paper in half and draw the human design on one half (e.g., an airplane) and the natural phenomenon on the other half (a bird). Bind the pages into a class book titled, “Mirror Images.”

Show videos that provide more information about adaptations. For example:

- [www.youtube.com/watch?v=Dw7z8Fo5ijk](https://www.youtube.com/watch?v=Dw7z8Fo5ijk) *Animal Adaptations: black bears (Ima Black)*, (4:22).
- [www.youtube.com/watch?v=YX8VQIJVpTg](https://www.youtube.com/watch?v=YX8VQIJVpTg) *Adaptation: (polkadotplace)*, (2:29).


Connect to previous lessons by discussing with students how zoos work to build suitable enclosures for their animal populations. The Winnipeg Zoo is well known for its Journey to Churchill exhibit. Explore with students how this newer enclosure better fits a polar bear population than previous designs did. Explain how looking at designs and assessing their suitability is also a component of the design process.
## Investigating Bears

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Grizzly Bear</th>
<th>Black Bear</th>
<th>Polar Bear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat</td>
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</tbody>
</table>
Video Viewing Guide

Name of Video: ____________________________

- Interesting Facts
- Questions
- Illustrations
## Adaptations

<table>
<thead>
<tr>
<th>Animal/Plant</th>
<th>Adaptation</th>
<th>Why the Adaptation Is Important to Its Survival</th>
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</tbody>
</table>
How Is Camouflage a Structural Adaptation?

1. Research to find out more about camouflage as a structural adaptation in animals.

2. Examine images of animal habitats to see how each type of animal is able to camouflage itself in its environment.

3. Create animals from Plasticine, and then create a diorama that camouflages one of the animals.