Chapter 2: How Does Climate Change Affect Our World?
Inquiry 3: Systems in the Natural World

- **Provocations** – *Posters, See/Think/Wonder, Think/Pair/Share*
- **Question Generation** – *"I Wonder" Wall, Question FormulationTechnique,*
- **Knowledge Building**– Invite a Speaker, Knowledge Building Circle
- **Determining Understanding** – *3-2-1 Strategy*
- **Pursuing Learning** – *Science Experiment*
- **Consolidation –** *Science Experiment*
- **Assessment Idea–** *Story, Art*
- **Take Action**

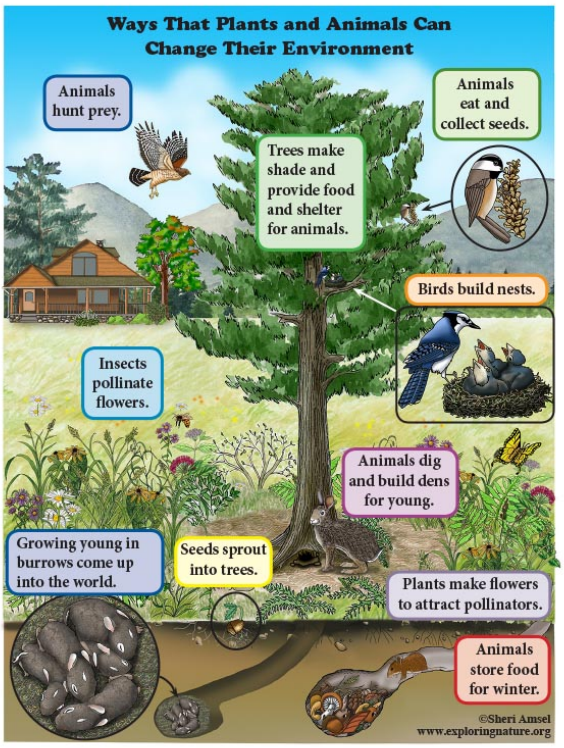
A. Provocation:

An initial provocation, also sometimes referred to as a "hook," is used to spark interest and curiosity.

Poster

Posters can be a great way of gaining student attention and interest. This link identifies the advantages to poster use in education and suggests 6 attributes of an effective poster.

Use the following poster along with the See / Think / Wonder strategy to initiate discussion with your students.



Possible questions:

- What do you notice about the animals?
- What systems do you notice in the poster?

AND

Display the quote:
"Look deeper into nature and then you will understand everything much better." - Albert Einstein

Use the Think Pair Share strategy. Students first spend some time thinking about the quote, then turn to a partner and discuss their answers with each other.

B. Question Generation

At this point in the inquiry, we want to harness students' curiosity and build off of the provocation that has captured their interest by generating meaningful questions to continue to drive the learning process. This section will outline an idea for question generation based on the provocation that your class engaged with.

I Wonder Wall

Continue to add to your **"I Wonder" Wall**. Post photographs of Natural Systems (ocean, grassland, temperate rainforest, lakes, mountains, wetlands). Have students come up with their own "I Wonder" questions about the natural systems.

In groups, create as many questions as possible.

Possible Questions:

- I wonder what animals live in these different systems?
- I wonder what would happen if I built a house here?
- I wonder what would happen if the water was polluted with plastics?
- I wonder what would happen to the plants and animals if there was a huge fire in the mountains?

Remember to generate questions following Question Formulation Technique rules for producing questions:

- Ask as many questions as you can
- Do not stop to answer, judge or to discuss the questions
- Write down every question exactly as it is stated
- Change any statement into a question

Add more questions to the board and put any duplicate questions together.

Feel free to repeat the "Put The Quest in Questions" video or some of the lessons).

Have the students categorize the questions again using an "O" for open and an "C" for closed. Remind them that the closed questions can be answered with some simple research and the open questions may lead to further investigation or a deeper inquiry. Review and prioritize those questions that they think will help the class better understand natural systems.

C. Knowledge Building

At this stage, students may be ready to engage in a group knowledge building activity. It will encourage students to open their minds to many alternative ways of thinking about the provocation and ideas that have been generated thus far in the inquiry process.

Invite a speaker

Invite a local community expert to learn about local climate impacts and local climate action responses.

Places to look for a local community expert:

- Naturalist groups
- Climate adaptation representative (municipal, provincial)
- Ministry of Natural Resources
- Conservation Authority/Agency
- Conservation NGO
- Indigenous Elders/Communities

Students can have the questions they generated on hand to prompt them to ask the speaker. Following the visit from the speaker, hold a **Knowledge Building Circle** example (outside is recommended if possible) so that students can voice what they've learned and build on their previous knowledge.

Possible Question:

- How is climate change affecting the systems in our community and natural world?

D. Determining Understanding

At this stage of the inquiry, use responses to inform and guide the learning process. They can provide insight into which concepts need clarity, what students are already well informed about, and a general direction that students want to pursue.

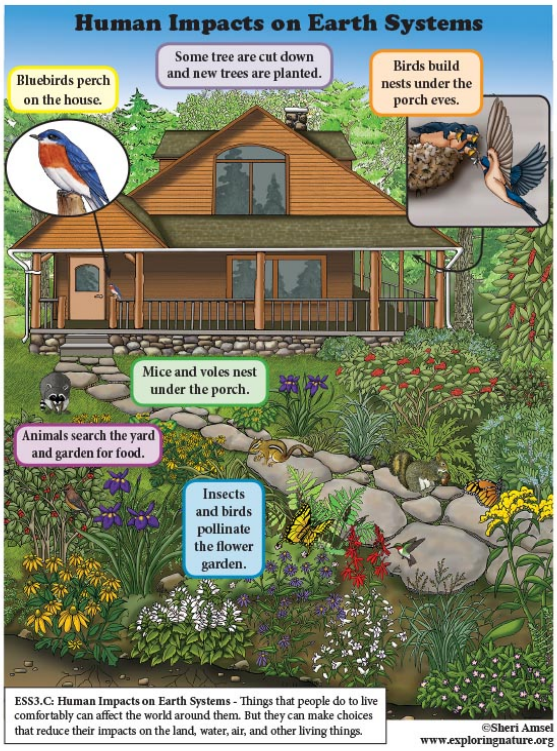
After hearing from your community expert, explore this strategy and follow up with the second poster to determine next steps.

Summarize Guest Speaker using the **3-2-1 Strategy:**

3-2-1		
3 things I learned	**2 things I want to learn more**	**1 question I have**

Note: For younger students it is recommended you do this as a whole class exercise.

Poster
Ask the students how human habitation affects the natural systems.



(Source: [Kindergarten - K-ESS2 Earth's Systems](#))

Possible Questions:
Is there a relationship between animals and humans?
How do humans affect the environment? (address this question from both a positive and negative perspective).

E. Pursuing Learning: Impacts on the Environment

At this point, students can begin researching to answer their general questions, or some of the following activities can be incorporated into the process to ensure that students understand basic concepts of systems, community, natural world and climate change.

Science experiment: **Build a Bottle Ecosystem**

The purpose of this experiment is to show how an ecosystem works. By varying certain parts of the system, we will show how the ecosystem can be affected.

Before starting the experiment, divide the class into 4 groups. Each group will build a bottle ecosystem but each will be slightly different.

Create an ecosystem so that you can make comparisons between the control and their bottles. Each group should use this worksheet to document the process: Bottle Ecosystem

Group 1: add more pebbles (half soil and half pebbles)
Group 2: add some moss instead of soil
Group 3: add compost instead of soil
Group 4: add only one seed and no pebbles

Possible questions:

- How is your bottle a system?
- How does the system work?
- By changing one interdependent part of the system, does it affect the other parts? How?
- Which bottle seems to be doing the best? Why?
- If you add something to your bottle or take away something will it help make it better?

Interesting article to share with the students: The sealed bottle garden still thriving after 40 years without fresh air or water | Daily Mail Online

F. Consolidation

This step is designed to encourage students to integrate and synthesize key ideas. When students make connections and see relationships within and across lessons, this helps them to solidify knowledge and deepen understanding.

Once the Bottle Ecosystem is complete, have students observe it over the next few days, encouraging them to record their observations in their journals.
Older students are encouraged to measure the growth of their plants.

Possible Question:
Can you think of other situations in the real world where changing something affects other systems?

Assessment Idea

Teachers will assess learning at different points throughout the inquiry using multiple methods. The following assessment provides an alternative evaluation method to standard quizzes and tests, that can be used after consolidation or at any point in the lesson to check for understanding.

Story

Once upon a time there was a forest and all living things lived peacefully together. The birds ate the seeds that the trees produced. The mice hid under the trees for shelter and warmth. The birds also built nests in the trees. Their young felt safe there, away from predators. Caterpillars ate the leaves and then cocooned to become beautiful butterflies. In the Fall, the squirrels buried the nuts the tree produced to prepare for winter. They also liked to climb up and down the trees for exercise.

One day, a family came along and cut down the trees to build a beautiful log house. Suddenly, all the living things were confused and didn't know where to find shelter, food and water!

Can you help the family by showing them what they could do to help the natural world stay happy and safe?

Instructions:

- On a large sheet of paper, invite students to draw a wooden house in the center of the paper.
- Encourage students to draw things around the house that humans could add to improve or help the natural environment.

Take Action:

Allowing time for students to take action is an essential part of the learning process on climate change, as it empowers students and eases their eco anxiety. Remind students that even when things get hard and seem so big they can always do something by taking an action. Their actions will create an impact.

These ideas for action can be utilized at any point in the learning process, whether it's now or after completing more guided inquiries. Please note that the suggestions are consistent in each chapter.

- Ask the students what things can be done to make sure that all of the systems we talked about are working well and will help climate change?
- Are there any projects that your students could partner with a community expert to increase biodiversity or help to restore a specific habitat?
- One system that we talked about was a bicycle. What can we do with a bicycle that will help climate change? What can we do to encourage other students and people in our community to ride their bikes to school and work?

Other Ideas for Taking Action:

- Habitat restoration
- Conduct a clothing drive
- Collect food donations for the local food bank
- Innovate sustainable solutions for school or community questions and problems

- Share your learning within your school and share your learning outside the class

Action Project Examples

How could you use these great examples to come up with action projects with your K-2 students?

"POLLINATOR GARDEN" – Algonquin Public School- Woodstock, ON (2017) K-2

- The main focus of the project is to inform and support young children in developing their understanding of insect life cycles and the interconnectedness of the beautiful creatures to our lives and to begin to foster an appreciation for nature and how they can have a direct impact on their local and national environment. They learned about the decline in the Monarch Butterfly populations during a professional development workshop and decided to plant a pollinator garden. See their project here.

- Ten Canadian Schools' stories of Climate Action
  - This document outlines a collection of promising practices of climate action taking place in 10 Canadian UNESCO Associated Schools. These 10 schools participated in a worldwide UNESCO pilot project to implement climate action as recommended in the UNESCO (2016) publication, *Getting Climate-Ready: A Guide for Schools on Climate Action.* https://bit.ly/3mpPtiY
- Young Voices for the Planet
  - This website documents youth speaking out, creating solutions and leading the change. These youth solutions to the climate crisis include stories of California kids banning plastic bags, Florida students saving their school $53,000 in energy costs, an 11-year-old German boy planting millions of trees and other young people changing laws, changing minds and changing society as they reduce the carbon footprint of their homes, schools and communities.Young Voices for the Planet
  - Resources for Kids Taking Action: Young Voices for the Planet | Award-Winning Film Series and Civic Engagement & Democracy Curriculum | For Kids
- The Great Plant Hunt from Ecoschool Global
  - The campaign aims to educate students about biodiversity, its importance and encourages them to take positive action. About the Campaign — Eco Schools
- Warming, Waste, Water, Watts, Wildlife (W5)
  - Through this project, thousands of students will be given opportunities to assess, design, and build innovative solutions to environmental challenges. Warming-Waste-Water-Watts-Wildlife (Alcoa W5) — Eco Schools
- Community Conversations for Climate Change
  - In this activity, students talk to members of their community about some of the environmental and climate changes they have noticed since they were young. Community Conversations for Climate Change | The World's Largest Lesson