Lesson 1: Phenomenal Phenology

<table>
<thead>
<tr>
<th>Unit:</th>
<th>Tracking Seasonal Change in Plants (Grades 3-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchoring Phenomenon:</td>
<td>Seasonal change in plants</td>
</tr>
<tr>
<td>Driving Question:</td>
<td>Why do plant change at certain times?</td>
</tr>
</tbody>
</table>

Lesson Overview:
Students are introduced to the curriculum’s anchoring phenomenon, seasonal change in plants. They learn about phenology and draw on their own experiences to illustrate seasonal changes in living things. Finally, they learn how these changes are driven by seasonal variation in weather through class discussion and a text.

Essential Questions:
How do living things change with the seasons?
What prompts plants and animals to go through seasonal change?
How can we keep track of seasonal change?

Objectives: Students will be able to (1) give examples of seasonal change in living things (2) define phenology and provide one reason for people to do it (3) explain that changes in weather can prompt plants and animals to go through seasonal change

Time Recommendation: ~ One 45 minute class period (plus time outside of class for independent work)

NGSS Alignment: See Unit Overview for list of NGSS standards being addressed.

Materials:
Internet access
Drawing utensils
KWL chart

Handouts:
Phenology Wheel
Timing is Everything Student Reading (with student questions)

Vocabulary:
phenophase, phenology, weather, migrate, hibernate, precipitation
Ahead of Time:

Before beginning this lesson, be sure to do the following:

- Read the Unit Overview

- Review information on phenology, the study of the timing of seasonal life stages (phenophases) in plants and animals. (alternative definition: the study of the timing of seasonal stages in plant/animal life cycles)

- Consider how to deliver this lesson in a way that works for your learning environment. For example, the entire lesson can be completed in person or during synchronous remote learning. However, steps 8 & 9 (see ‘Procedure’ below) can be completed independently during asynchronous learning with no modifications to the lesson plan.

LESSON

Launch:

1. Introduce the anchoring phenomenon (seasonal changes in plants) with a time-lapse video or pictures showing seasonal changes in plant(s) (see the Resources section for video options). Give students a minute to write down any wonderings they might have.

2. As a class, begin to fill out a traditional KWL chart (What do I Know? What do I Wonder? What have I Learned?) on a shared document or large piece of paper - somewhere it can be saved and revisited throughout the unit. Have students share what they know (or think they know) about seasonal change in plants and what they are wondering.

3. Ask the class if they can think of other living things that change with the seasons. You may want to use the following prompts: What do you do in different seasons (e.g. swim versus wear a winter coat)? What do animals do or look like in different seasons (e.g. brown bears hibernate in winter, some dogs get thicker coats in winter, bugs like mosquitoes or fireflies are more active at certain times of year, many birds have seasonal migrations and have babies in spring/summer, etc.)
Procedure:

1. Explain that another word for some of the changes you’ve discussed is ‘phenophase’ and give the definition (a seasonal life stage in an animal or plant). Examples of phenophases = period of time during which a plant is growing new flowers or a bear is preparing for hibernation

2. Ask: Why might knowing when these changes occur be important? (Possible answers: It is good to know when the flowers you’re allergic to bloom or when to pick apples, when to hold certain festivals (e.g. the cherry blossom festival in Washington D.C), when to go deer hunting or wildlife watching)

3. Ask: How can seasonal changes around you be recorded?” Work together to come up with some examples (e.g. Record when you first see a baby deer on your calendar, Write down the date you first see a leaf fall off a tree in Autumn)

4. Introduce the term phenology – the study of the timing of seasonal life stages (phenophases) in plants and animals. In other words, phenology is studying plants and animals and recording what they are doing and when they are doing it!

5. Explain that some people like to keep track of the seasonal changes they observe with a ‘phenology wheel’. See here for an example/description of a phenology wheel; more examples can be found in the ‘Resources’ section)

6. Introduce the phenology wheel handout. Explain that students can use it to show how the world around them changes, including living things and their environments (e.g. weather). Help them brainstorm a couple of ideas for what to draw in different sections of their wheel. 

   Optional: If possible, have students go outside or look out the window to make observations and get ideas for what they can draw on this season’s section of their phenology wheel (or encourage them to do this later).

7. Ask students: How do animals/plants “know” when it is time to change? (For example, how does a bird know it is time to fly south for winter?). Explain that humans often use calendars to keep track of important events, but animals can’t do that! (Possible prompt: How would you know when to swim vs wear a coat if you didn’t know the month?).
Optional: If students are outside, ask them how they might guess the season if they did not know the time of year. Have them use different senses (e.g. eyes, touch, smell).

8. Tell students they will use a text to help them answer the question posed above (step 7). Give them time to read the ‘Timing is Everything’ reading and answer the associated reflection questions.

Scaffolding suggestions: Consider utilizing one or more of the strategies to support student reading laid about by the American Museum of Natural History. For example, you may choose to do an interactive read aloud if working synchronously or develop an interactive reading guide to support students during asynchronous learning. Free online tools such as Read&Write can also support student reading during asynchronous learning.

9. Give students time to work on their phenology wheel. Encourage them to talk with families/friends about what seasonal changes they notice in order to help them complete their wheel.

Closure:

1. Review answers to the ‘Timing Is Everything’ student reading questions. Share a good answer to the bonus question and go over how students can answer questions using claims, evidence, and reasoning.

2. Return to your class’s KWL at the end of this and other lessons, to review what they know, to see if they have answered all of their wonderings, and to share what they have learned.

3. Once the phenology wheels are completed, have students share them with their families at home or with the class via a picture, Flipgrid video, etc.

RESOURCES:

Videos for anchoring phenomena:

- Time lapse video showing seasonal change in various plants (play first 41 seconds) https://petapixel.com/2020/05/14/this-beautiful-four-seasons-time-lapse-took-3-years-to-shoot/
- Time-lapse video of an apple tree branch https://youtu.be/sNbxkiDIWho. This video shows a branch of an apple tree through an entire growing season. You can see the full range of deciduous tree phenophases.

Student-friendly video introducing phenology: https://www.youtube.com/watch?v=4Qf7in_IRx8

Examples of phenology wheels for reference:
- This wheel shows changes in plants and, on an inner wheel, other seasonal changes like weather or holidays.
- This wheel shows seasonal changes in landscapes and living things.