



Grade Levels

9-12

Overview

Conduct this activity before students are introduced to data collection using the Nature's Notebook observation protocols. This activity will familiarize students with some of the main phenophases present on select species during certain times throughout the school year. After students do this activity you may wish to have them make observations using the *Nature's Notebook* observation protocols and then at the end of the year students can view their collected data in conjunction with the data they viewed during this activity.

Background

Phenology is the study of the timing of life cycle events, done mostly through personal observations.

Real-world Connection

It's important to mention to students that variability is normal in the natural world. If they do not see changes when they expect to, or among all individuals of the same species, they should be cautioned against leaping to conclusions. Encourage them to think carefully about what they have observed and consider as many explanations as possible.

Citizen Science Connection

This activity can be completed with or without a *Nature's Notebook* account. Completing it with an account can provide an opportunity to teach students about the importance of citizen science, and how their contributions help us to better understand the world around us.

Estimated Time

This activity can be done throughout the course of the academic year. Depending upon how much time is available, teachers can revisit the activity more than one. Ideally teachers should set aside at least 4 or 5 class sessions of 50-90 minutes. Conduct this activity prior to asking students to collect phenology observations using the *Nature's Notebook* protocols.

Learning Objectives

Participants will be able to:

- Identify five local plant species.
- Understand why plants undergo changes throughout the year
- Name four phenophases.
- Understand why we study phenology.
- Make observations of plant structures and relate them to function and phenology



Next Generation Science Standards

| LS: Life Science | | | |
|------------------|--|----------|---|
| | Grades 9-12 | | Grades 6-8 |
| HS-LS2-2 | Use mathematical representations to support explanations of factors affecting biodiversity and populations in ecosystems at different scales | MS-LS2-2 | Construct an explanation that predicts patterns of interactions among organisms along multiple ecosystems |

Conducting the Activity

Materials

Resources needed

- A selection of 5 different species of plants
- Clipboards and paper or nature journals
- Something to write with
- Phenophase photo guides or field guides
- Outdoor space to conduct the activity - find an area where you can take your class that has at least 4 stops with 5 tagged plants where they can collect phenology data.
- *Nature's Notebook* data sheets for the 5 species you selected
- Access to at least one computer with Internet access

Engage

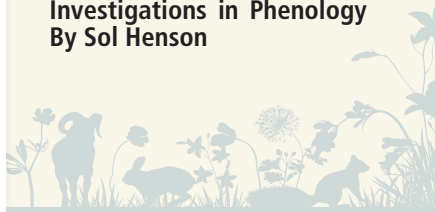
Connect to prior knowledge

- Give students some intriguing part of a plant. This could be willow catkins, buckbrush flowers, manzanita berries, a gall. Have them make "I notice" and "I wonder" observations about the object. If they have seen the object before, tell them that the goal of the exercise is to observe something they have never seen before.
- Zoom in/Zoom out - get students to journal using the zoom in/zoom out method. First students draw the plant as the actual size. Then have students draw a close up of one of the structures of the plant. Make sure students focus on the details and tell them not to worry about trying to draw a work of art. Let them know that they will continue to get better the more they do these kinds of drawings. Have students that want to describe their drawing talk about their plant and the special structure they drew.

RESOURCES

Adapted from:

Investigations in Phenology
By Sol Henson



NOTES ON ACTIVITY

Conducting the Activity

Explore

Hands-on learning

1. Adaptations
 - a. Ask the students if the structures they drew are so different in different plants? Ask them why different plants may have developed different kinds of structures?
 - b. Tell the students that not only are the structures very different, but they also appear and disappear at different times of year depending on the plant. Ask them why that might be and let them know that we are going to explore this question further.
2. Pheno-Hike
 - a. 4 stops with 5 or more tagged plants at each
 - b. Students observe the tagged plants in pairs. Each pair can observe a couple plants or do all of them, time dependent
 - c. Using the *Nature's Notebook* datasheets, have the students answer questions about the Phenophases of the tagged plants: Does the plant have Leaves, colored leaves, flowers, fruits/seeds?
 - d. Note any mix of shade and sun, species at different trail stops= repetition and variation
 - e. Between stops play trail games or have them look a particular structure or phenophase as they walk

Explain

Listening and communicating understanding

- Discussion - frame the data that was collected
 - a. Transition into talking about seasonal changes (Are all of parts of a plant present at all times?)
 - b. What is phenology? Why do plants change throughout the year?
 - c. Why does it matter?
 - d. Intro to our project
 - i. Overarching question: How is the phenology of our five-study species changing over time?
 - ii. Specific question: How does the phenology of a plant relate to its structures?

Extend

Group projects, real world connections

- Look at the data
 - a. Compare and contrast the species and relate phenological differences to structures
 - b. This discussion can be season dependent e.g. fall- why would redbuds drop their leaves and scotch broom doesn't? spring-different types of flowers for different pollinators, seeds- think about dispersal and durability, etc.
 - c. Compare student data to data collected from other groups using the [USA-NPN Visualization tool](#)
 - d. Reiterate the idea that they are scientists collecting real data on a large-scale project
 - i. If this activity is conducted over several years with several classes, compare the data of the current class with what was documented in previous years.

Evaluate

Summarize, check for understanding, assess

- Group check-in and closing
 - a. What did the students find the most interesting about their experience?
 - b. What did they find confusing or not interesting?
 - c. What did the adults take away from the lesson? What did the find interesting or confusing?