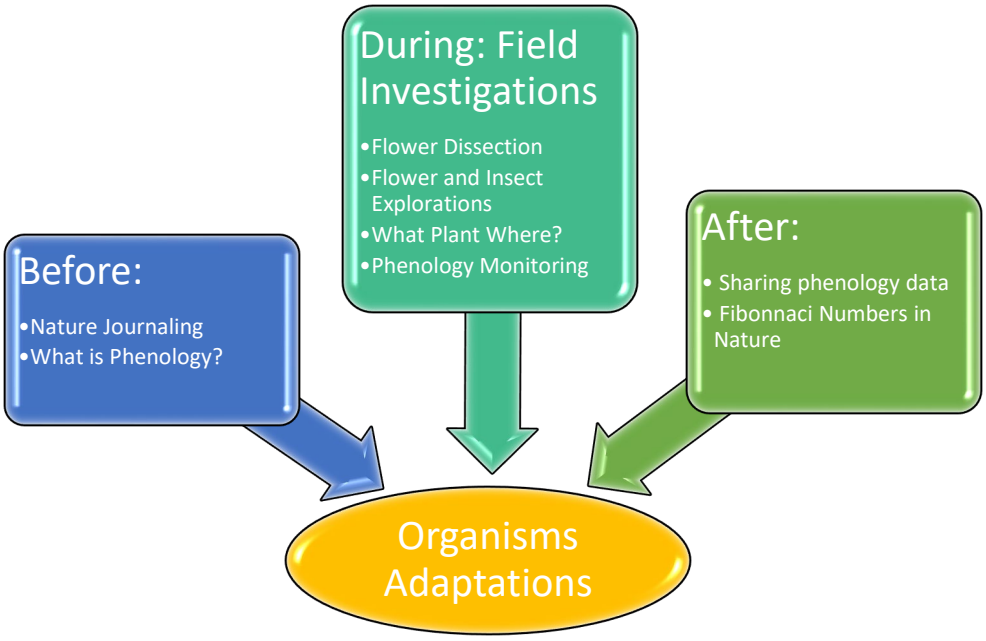
FLOWER FUNCTIONS



Your students will be visiting Blandy to engage in a field investigation focused on flower structure and function. To enhance classroom connections, we have developed this lesson cluster. Field investigations are more meaningful to students when they are integrated into their curriculum. This lesson cluster can be used to introduce and review or synthesize for a systems approach and increase depth of knowledge. Before-visit activities introduce students to nature journaling and careful observation skills as well as community science monitoring projects. With the after-visit activities, students become part of a global community science project sharing their data as well. They also find mathematical patterns in nature.

FLOWER FUNCTIONS

BEFORE 1: Nature Journaling

Background: This activity is adapted from a project funded by the Brown Fund at the Library of Virginia

For full lesson plan: go to https://blandy.virginia.edu/content/ed-schoolyard-botany-lesson-and-activities and click on Creating a Nature Journal.

Virginia Standards addressed:

English (2017) K.11, 1.12, 2.10, 3.8, 4.7, 5.7

Instructional Strategy:

1. Journal Making:
    a. Give each child their materials and explain how to put the journal together, or go through step-by-step, depending on your grade level and your students.
    b. To put the journal together, cut two pieces from the paper bag for the cover. Punch holes in the cover pages. You can use sticks to attach strings to then put through the holes to hold the book together.
    c. Show a book or magazine from your classroom which has a photo on the cover or title page. Show how books often have a brief explanation for the picture.
    d. On the back of the title page, ask each student to write a brief description of their photo. (They can use their imaginations for this!)
2. Journaling in the Schoolyard
    a. Give students the opportunity to view a variety of field guides. Discuss the kinds of information they see, and why it is helpful to the reader. Discuss the kinds of pictures that are in the books.
    b. In an area of the schoolyard with a variety of plants, allow students the opportunity to spend some time observing the plants and deciding about which to journal. Remind them to be as detailed as possible in their line drawing and use their hand lenses and observation skills to look closely and use details in their representations.
    c. Discuss what kinds of information should be written next to their line drawings. (Examples: measurements, date, time of day, detailed descriptions, colors, how many of that plant are in the area.)

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BEFORE 2: What is Phenology? Practicing phenology in the schoolyard

Before your visit to introduce phenology, monitoring, and citizen science.

Background Lesson Preparation:

For an overview of Phenology and monitoring, review community science activities https://budburst.org/plant-animal-interactions and activities designed for educators at https://budburst.org/activities/for-educators/grades-3-5 Assess your students' cognitive levels and adjust data sheets or journal prompts as needed. Coordinate this activity with the seasons (look around the schoolyard to see what plants are budding, flower, fruiting, etc.)

VA Standards Addressed: Science 4.1

Instructional Strategy:

1. **Hook**: Watch this video https://www.youtube.com/watch?v=SHHkmOh942A with students. Watch it once. Then introduce the concepts of phenophases. Watch it again, pausing the video to note these events in the flower's phenology:
    - Flower Buds at 0:01
    - First Flower at 0:12
    - Full Flowering 0:32
    - Fruit Development at 0:41
    - Full Fruiting at 1:05
2. Solicit student responses to the question: Why do scientists study the phases or stages of plant life?
3. Introduce the concept of community or citizen science. From Wikipedia, "Citizen science is scientific research conducted, in whole or in part, by amateur scientists. Citizen science is sometimes described as "public participation in scientific research," participatory monitoring, and participatory action research whose outcomes are often advancements in scientific research, as well as an increase in the public's understanding of science." ALTERNATE: Provide the phrase "community science" and instruct students to break down the words to determine what it means. And then, build a classroom definition.
4. Take students outside with nature journals (you may want to include journal prompts for students as needed) to choose a plant to make careful observations of its structures and phenophases.
5. Allow students at least 15 minutes with their plant.
6. Wrap-up: Ask students what they observed. Generate a list of observation on a large white board or smartBoard.

FLOWER FUNCTIONS

DURING: Field Investigation

VA Standards addressed Science (2018) 4.1, 4.2, 4.3, 4.8

During your field investigation at Blandy, your students will engage in several indoor and outdoor lessons where they examine flowers and other plant parts to develop an understanding of adaptations and explore the coevolution of flowers and pollinators.

Below is an overview of the "typical" program activities to assist you with integrating this field experience into the classroom experiences. The activities can change due to weather, volume of students, or communication with environmental educators.

* **Flower Dissection-** Using microscopes and hand lenses, students examine and dissect flowers to explore adaptations.
* **Flower Exploration-** Students develop observation skills through close examination of flowers and pollinators. Data are recorded and discussed.
* **Phenology**- Students are community scientists to observe and record data on plant phenophases**.**
* **What Plant Where? -** Students explore and observe native plants for attributes (height, width, flower color, leaf shape, and habitat) important for a diversity of life in a native plant garden.

FLOWER FUNCTIONS

AFTER 1: Joining the Phenology Network

Standards Addressed: Science 4.1

Preparation: Sign up as a participant for the Nature's Notebook with the USA National Phenological Network https://www.usanpn.org/natures_notebook. (It has a mobile app as well!) and https://www.usanpn.org/nn/educate/activites The organization has numerous resources (a few highlighted in this cluster) that you with want to familiarize yourself with. Be sure you use a password and username that you can share with students.

Instructional Strategy:

1. **Hook:** Using student nature journals, engage in small group discussions of their observations made during the field investigation and schoolyard, if applicable. Prompts: What was something unexpected or interesting you discovered or drew? Can you describe it to someone using your journal notes?
2. Enter data: In small groups, each student chooses one plant or flower to enter into the citizen science database. If your school has tablets or a computer lab, give each group an electronic device. Choose one organism you observed and use your classroom Smart or white board to model how to enter the data with your students.
3. Check student work before they hit submit.
4. Explore the data: Each group navigates to https://www.usanpn.org/user?destination=MyNPN to explore their citizen scientist data.
5. Students can compare their data to data from others at https://budburst.org/data

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AFTER 2: Fibonacci- Numbers in Nature

Background: "Numbers in Nature" explores the Fibonacci sequence as found in nature. This website, http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fibnat.html#section3 is a nice reference for learning about the Fibonacci sequence. This activity integrates math and science. Through careful observations, students notice mathematical patterns and sequences in nature!

VA Standards Addressed: Math 4.15

Preparation: Collect or purchase pine cones. (Remember to ask permission if looking for cones on public or private land.) This activity does not work with every species of pine; test your cones before collecting or buying. On the website, you can view the spirals drawn in both directions. You might also use pineapples or flowers. Keep in mind: it is best to use native flowers rather than cultivars that are altered by humans.

Instructional Strategy:

1. Hook with the video found here: https://www.youtube.com/watch?v=P0tLbl5LrJ8
2. Instruct students to explore the pattern in their small groups. The Fibonacci sequence (named for the Italian mathematician Leonardo of Pisa who lived from about 1170-1240 A.D.) is: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144…
3. Ask the students to describe the pattern they find using mathematical language. Each subsequent number is equal to the sum of the previous two numbers of the sequence. Ask: In this sequence, the next number would be…?

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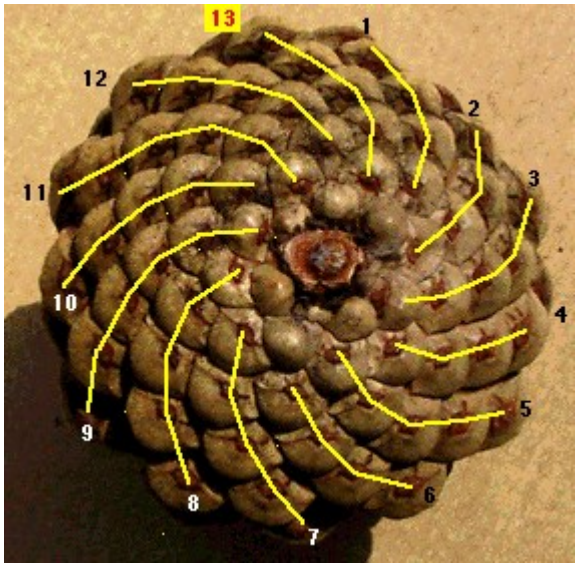
Numbers in Nature Student Page

Practicing Fibonacci:

Fibonacci sequences appear in nature, such as the branches of trees, leaf arrangement on a stem, the fruitlets of a pineapple, flower petal numbers, an uncurling fern, a snail shell, and the arrangement of scales on a pine cone.



Look at your pinecone. Use a pencil to trace the spirals from the base of the cone (where it connects to a branch).

How many spirals did you count?

_____

Now, trace the spirals in the opposite direction. Now count them. How many did you count?

_____

Do these numbers "fit" the Fibonacci sequence? Explain your reasoning.

_____

_____

Extending Fibonacci:

Look for the Fibonacci numbers in other places in nature. For example:

- Cut an apple crosswise: How many chambers are there with seeds?
- Does a banana break into sections lengthwise? How many?

Where else in nature can you find the Fibonacci sequence?