GOFLAG
GENEALOGY OF FLAGELLATE PLANTS

GOFLAG SCIENCE CLUB

The GoFlag Science Club is a curriculum of 4 activities to help improve children's awareness about plants in general and provide specific information about a special group of plants called flagellate plants. The GoFlag Science Club is a part of the GoFlag Project – "Building a comprehensive evolutionary history of flagellate plants" – funded through NSF's GoLife program.

Flagellate plants have existed on our planet for a long time (~300 million years) and include approximately 30,000 species of bryophytes, lycophytes, ferns, and gymnosperms. These plants offer some important clues on how plants evolve and adapt. There are several ways to classify flagellate plants based on their genetic and morphological traits but one of their most unique features is the absence of flowers.

The GoFlag Science Club was developed and implemented as non-formal learning experience for 2nd and 3rd grade students who participated in an optional afterschool enrichment activity offered by the school. The 45-minute activities were implemented on weekdays for four consecutive weeks in the fall semester. The learning activities and approaches described in this implementation guide can be customized for other grade levels in elementary and middle school.

GRADE LEVEL

- Elementary school
- Middle school

*You can find additional activities for this and other age groups on GoFlag Voyager.

LEARNING OBJECTIVES

- Explore plants in their natural environment (plant exploration activity)
- Describe differences and similarities between plants (compare and contrast activities)
- Identify morphological characteristics (owl craft activity)
- Develop models that represent spore dispersal strategies (catapult activity)
- Discuss the importance of plants (moss bingo activity)
- Measure water absorption (moss measurement activity)

CURRICULAR CONNECTIONS

- Decomposition
- Energy
- Ecosystem preservation

- Human history (mummies)
- Plant reproduction
- Force (physics)

PLANTS

- Pines
- Mosses
- Ferns

IMPLEMENTATION SUGGESTIONS

- Optional or required enrichment activity following a class on related topics (e.g., force, plants, life cycle)
- Four face-to-face classes, each about 45 minutes long, done in small groups

PRE-ACTIVITY IDEAS (ANCHORING)

- Invite a botanist to introduce the Science Club and the concept of flagellate plants
- Take the students to a botanical garden and identify flagellate plants
- Show the students a slideshow of plant photos and ask them to describe the differences (e.g., do all plants have flowers?) as a way to introduce the notion of flagellate plants
- Bring a flagellate plant to school and ask students to describe where they have spotted a similar plant before

DAY 1: PLANT EXPLORATION

Introduction

- Invite the kids for a walk around the school
- Ask the children to draw a plant in the sidewalk using colored chalk

Discuss how we all have different drawings because plants can indeed be different. Discuss that despite some differences, all plants have some things in common too. Use this as a transition for the exploration activity.

Exploration Activity

- Invite the kids to an area with lots of plants (e.g., by the creek)
- Ask children to look around and think about some differences and similarities between plants

- Ask children to closely exam the plants and use notecards to:
    - write at least 2 things that all plants have in common (one side of the card)
    - write 2 things that *only some* plants have (other side of the card)

Reflection
Go back to another sidewalk and ask children to draw another plant based on what they saw during the exploration activity.
Or
Go back to the same sidewalk and ask children to update their drawings based on on what they saw during the exploration activity.

Materials
- Assorted colors sidewalk chalk
- Assorted colors index cards
- Pencils

Related Images

Costs: varies

DAY 2: IS THIS A SPONGE OR A PLANT?

Introduction
- Bring a bag of moss and ask the children to guess what it is?
- Explain that this is actually a plant called Sphagnum moss
- Show pictures of green and dry mosses to the children
- Invite the children to search for mosses on the school premises

Measuring Activity
- Divide the children into small groups of 3 or 4
- Give each group one of the following:
    - Sponges

  - Paper towels
  - Dry moss
  - One identical container filled with water
  - Measuring cup
- Instructions: Use your material as a sponge and fill your container with water. You have 1 minute.
- Use this index card to record how much water your group transferred to the measuring cup.
- Time the activity: 1 minute
- Have each group make a graph that shows all 3 groups' measurements

Reflection

- Which of these 3 materials can hold the most water?
- So, sphagnum moss can hold a lot of water.. What other things sphagnum moss be used for – diapers, bandaids, gauze pads, soil for plants such as blueberries, for decorations etc?

Materials

- Dry moss
- Picture of dry and regular mosses
- Index cards
- Pencils
- Measuring cups
- Containers

Related Images



Costs: varies

DAY 3: FROM PINE TO OWL

Introduction

- Ask the kids a week in advance to bring a pine cone if they have one?
- Images/Video of pine seeds? Find a pine cone with seeds? Throw a seed and get it to fly?
- Pines are very important trees (habitats for many animals, what animals might live in a pine tree?)
- Video of owl in a pine tree

- Show different parts of a pine tree to the children: bark, leaves, and cone
- Ask the children if they know what these things are and where they come from
- Invite the children to explore the school premises in search of a pine tree
- Ask children to explain how they found the tree. What parts of the tree called their attention or were they looking for?

Discuss how pine trees are different from mosses (discussed in the previous activity). Use this as a transition for the owl craft activity.

Owl Craft Activity

- Play sounds of native owls
- Show a model of a snow owl (native owls, native species: barred owl, barn owl)
- Give a pine cone to each child
- Provide containers with different sizes of googly eyes, felt, and cotton
- Ask children to create their own unique snow owl to take home

Reflection

Ask the children what to name their favorite part of a pine tree and why they selected it.

Materials

- Pinecones
- Pine bark
- Pine leaves
- White and beige felt and a tiny bit of orange one too
- Cotton balls / cotton
- Googly eyes
- Glue
- Scissors
- Link to model: https://www.easypeasyandfun.com/pinecone-winter-owls-craft/

Related Images




Costs: varies

DAY 4: HALLOWEEN CATAPULT

Introduction

- Show a picture of a fern to the students
- Invite the children to explore the school premises in search of a fern
- Ask children look behind the leaves to identify the spores

Discuss how ferns have these tiny structure called spores. Use this as a transition for the catapult activity.

Halloween Catapult Activity

- Show a 2-minute video about the strategy ferns use to spread their spores so that other ferns can be born
- Discuss with the children how the plant uses a system that is very similar to a catapult
- Show pictures of a catapult (e.g., Asterix comics)
- Ask children to create their own unique catapult by using the materials and model provided
- Ask each child to use their catapult to throw their projectiles (3 wrapped eyeball candies) just like ferns do to spread their spores
- Use 2 or 3 large containers with pieces of brown paper on them to represent parts of soil that are rich in nutrients – what type of environment might they like? Wet? Shady? Proper soil.. Colors (green, brown, black good; red, orange, yellow, blue bad; no white paper) – they make an environment, mosaic, aim for the good soil. Write the property on the paper (wet, dry, hot, blue – water)
- Count how many they got in good vs. bad environment
- Ask children to measure the distance their farthest "spore" fell from the "parent fern"
- Optional: you can have more candies hidden in the containers for later distribution and Halloween celebration
- Optional: children can color their catapults to take home

Reflection

Explain that although in reality ferns cannot select a specific location for their spores to fall, it is beneficial for the "baby" fern to grow in a rich soil away from other ferns that would compete for nutrients in the soil.

Materials

- Picture(s) of ferns
- Large short containers
- Shredded brown paper
- Individual wrapped eyeball candies (or other types of candies based on the holiday season)
- Popsicle sticks
- Small rubber bands
- Plastic spoons
- Video about the life cycle of a fern: https://www.youtube.com/watch?v=LlyqzOpyM9U
- Link to model: https://gosciencegirls.com/catapult-stem-project/

Related Images




Costs: varies