

Plant Evolution Scavenger Hunt

Venture out into the field for students to familiarize themselves with algae, mosses, ferns, cone-bearing plants, and flowering plants, as well as their characteristic traits and evolutionary adaptations.

2nd-HS

NJSLS Connections:

2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.

4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

HS-ESS2-7: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.



Learning Objectives:

- **List** plant and non-plant evolutionary groups
- **Describe** basic traits of each plant evolutionary group
- **Categorize** plants in the field into their evolutionary groups and differentiate from lichen, fungi, and algae
- **Infer** how traits of each evolutionary plant group aid in plants' survival, and/or the environmental conditions those traits may have evolved under

Instructor Background

The story of plant evolution begins with tiny, single-celled organisms called algae. These algae lived in water and were the first photosynthetic organisms, using sunlight to create energy. Over time, some algae-like organisms adapted to life on land. As they lacked roots and specialized vascular tissue, these early land-dwellers faced numerous challenges such as staying hydrated and supporting themselves without the buoyancy of water. Mosses are an example of this plant group.

Later, plants evolved roots to anchor themselves and vascular tissues like xylem and phloem, which allowed them to grow taller and transport water and nutrients more efficiently. However, they reproduced through spores, not seeds. Ferns are examples of these types of plants. Gymnosperms (e.g. conifers) evolved seeds which were held in open cones. The name “gymnosperm” means “naked seed”. In contrast with spores, seeds provide protection and nourishment for the plant embryo. Angiosperms, the most diverse group of plants, evolved flowers, which improved their ability to reproduce through insect pollination. Instead of open cones, the seeds of angiosperms are encased in fruit, which facilitate seed dispersal by serving as a food source for animals. “Angiosperm” means “container seed”.

Plant Evolution Scavenger Hunt

Supplies

- Plant Evolution Scavenger Hunt worksheet
- Plant Groups Trait Table worksheet
- Writing utensils, colored pencils

Optional:

- Hand lens or magnifying glass
- field guides
- clippers and/or shovel
- Clipboards or cardboard to lean on

The spore-bearing fertile fronds of the Sensitive fern (*Onoclea sensibilis*) persist through the winter.



Preparation

Scout or plan a route for your scavenger hunt and ensure that you can find at least two examples of each evolutionary plant group, and potentially examples of algae, lichen, and fungi as well, to compare and contrast.

Procedure

Introduction

Ask questions to spark discussion:

- What even is a plant?
- Do all plants have roots?
- Do all plants have seeds, fruit, and flowers?
- Do all plants have leaves?
- Are trees/lichens/fungi/algae/etc. plants?
- Do trees have flowers?
- Why do some trees have cones?

Show the “What is a plant?” slide deck. With each organism group featured, ask students to discuss with a partner or as a class if the organism is considered a plant or not and why.

This bristle moss (*Orthotrichum sp.*) has bright yellow spore-bearing capsules.



Eva Popp

Activity

1. Head outdoors to conduct a scavenger hunt in search of plant specimens from each evolutionary group. You may divide the class into teams and challenge them to each find examples of all four plant groups or simply collect specimens that look interesting and work out their identification later. Try to find multiple examples of each group.
2. Have the class organize their collected specimens into the four plant groups discussed in the slides: mosses, ferns, cone-bearing plants, and flowering plants. If disagreements arise, ask questions to help students in come to a unanimous conclusion.
3. Once all collected plant specimens are organized into their evolutionary groups, confirm students’ correct answers or guide them in reconsidering their selections.

Ask and Discuss

- What are the characteristic traits of each evolutionary plant group you observed?
- How does [trait] help with a plant’s survival?
- What environmental conditions may a plant with [trait] be adapted to?
- In what ways may [trait] limit the chances of a plant’s survival?

Trait Table Worksheet

Complete the worksheet to compare and contrast the significant traits of each plant group. This activity is adapted from the “What is a Plant?” activity on page 1-10 of Project Botany by the Institute for Applied Ecology, licensed under CC BY 4.0.

Materials

- What is a plant? slide deck
https://docs.google.com/presentation/d/194BWZmAkxmAhxe1e9Tfm_VjDcU1itJUG_zITFjsE9qs/edit?usp=sharing
- Scavenger hunt worksheet
https://www.canva.com/design/DAGAFcLs8lg/gFzcXsW64apgthy7E_Nk_w/edit?utm_content=DAGAFcLs8lg&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton
- Plant groups trait table worksheet
https://www.canva.com/design/DAGAFcoQrHc/a02i8Ds76Riml5XGFonlJw/edit?utm_content=DAGAFcoQrHc&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

Resources

OneZoom, interactive tree of life explorer

<https://www.onezoom.org/>

Videos

- How did plants evolve?
https://www.youtube.com/watch?v=ciGqnGFWqBs&ab_channel=CrashCourse
- How plants caused the first mass extinction
https://www.youtube.com/watch?v=mAkjETPM1s4&ab_channel=PBSEons
- Evolution of plants
https://www.youtube.com/watch?v=30sRDSLxmbQ&ab_channel=LongwoodGardens
- Plant evolution with timelines and phylogeny
https://www.youtube.com/watch?v=lQHo7nlqjsg&ab_channel=Herv%C3%A9Sauquet