Morris Arboretum of the University of Pennsylvania
Official arboretum of the Commonwealth of Pennsylvania

Teacher's Guide to the Plant Reproduction: Seeds & Seed Dispersal tour

The objectives of our Plant Reproduction: Seeds & Seed Dispersal tour are:

1. Students will be able to describe what a seed is and its purpose.
2. Students will be able to name where seeds are found.
3. Students will be able to list 4 seed dispersal methods and describe a seed for each method.
4. Students will be able to describe the importance of seed dispersal.

Before students visit, they should understand:

- What the parts of a plant do:
  - **Flowers:** make pollen and ovules. When egg cells in ovules and sperm cells in pollen combined, they make seeds.
  - **Leaves:** make food for the plant (photosynthesis) by gathering light energy from the sun and carbon dioxide from the air and using water from the soil.
  - **Stems or trunk:** transport water up and food down the plant.
  - **Roots:** take up water and nutrients from the soil.
- What plants need to survive: *Air, water, light, nutrients, appropriate temperature and space to grow.*
- What the life cycle of a flowering plant is
- There are a variety of fruits and seeds

Vocabulary:

Buoyancy	Fruit	Propeller
Catapult	Germination	Protection
Dispersal	Hitchhiker	Reproduction
Embryo	Nourishment	Seed
Expulsion	Parachute	Seed Coat
		Viable

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These Academic Standards for Environment and Ecology of the Pennsylvania Department of Education are included in this tour and/or pre- and post-visit activities:

4.3.7 Environmental Health
Explain biological diversity.

4.6.7 Ecosystems and their Interactions
Explain the concepts of cycles.
Explain how ecosystems change over time.

4.7.7 Threatened, Endangered and Extinct Species
Describe diversity of plants and animals in ecosystems.

4.8.7 Humans and the Environment
Explain how human activities may affect local, regional and national environments.

These Benchmarks and Cross-Cutting Concepts / Skills from the Curriculum of the School District of Philadelphia are included in this tour and/or pre- and post-visit activities:

NATURE OF SCIENCE:

- Design, modify, and conduct an investigation through testing, revising, and occasionally discarding ideas, all of which lead to a better understanding of how things work.
- Conduct a scientific investigation lasting for several days in which students have to control one variable.
- Collect and summarize data from an experiment and interpret the results in terms of the data.
- Recognize and analyze alternative explanations and procedures for evidence.
- Communicate scientific procedures and explanations, using a variety of presentation techniques including graphing software.
- Work in cooperative groups with specific roles and responsibilities.

LIVING ENVIRONMENT:

- Describe how organisms with similar needs may compete with one another for resources and how some survive and others do not.
- Describe how organisms with similar needs interact with one another in various ways including providing food, e.g., dead plant and animal material.
- Observe and identify the reproductive parts of plants
- Discuss that in order for offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next.
- Recognize that differences in individuals of the same kind may give some advantage in surviving and reproducing.
- Examine reasons why organisms with certain traits are more likely than others to survive and have offspring, e.g., environmental conditions and disease.
- Explore the wide variety of organisms and their different habitats.

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SUGGESTED PRE-VISIT ACTIVITIES

Collect and Dissect

1. Have students collect various seed "containers" such as fruits, pods, capsules, etc.
2. Cut open fruits and pods in cross section to see how seeds are arranged.
3. Measure fruits, measure seeds and graph the results.
4. Try to determine the seed dispersal method for each "container" and categorize the seeds.
5. Soak seeds in water, dissect, look at them under a microscope and draw what you see inside.
6. Look at the placement of seeds: Cut open fruit (cross section), count seeds on stems, keep track of info for spring (look at stamen and pistil)

SUGGESTED POST-VISIT ACTIVITIES

Build a Seed

Out of craft pieces, cans, plastic containers, recycled cardboard, etc, students can build their own seed and determine how it would be dispersed. Design and draw a picture of a seed that would disperse in a certain way. For example, what kind of seed could you design to be dispersed by sticking to a soda can?

- Draw a picture of the new seed.
- Write a story about what happened to the seed
- Send a story back to Morris Arboretum letting us know what happened.

Plant a Sock

Wearing an old pair of socks, walk around the schoolyard or backyard. After some seeds have collected on it, try planting the sock in a pot of soil. Nearly fill a pot with potting mix and place the sock with seeds on top. Cover the fabric with ½ inch of potting mix and water in well. Put in a sunny spot and keep moist and see what sprouts!

Seed Identification & Germination

Give students a packet of seeds. The packet will include corn, peas, limas, etc. Explain that the students can germinate these seeds by placing them on a paper towel and placing the towel between two glasses. Put the seeds on the paper towel so that the seed is visible through the outside glass. Water the towel and see what happens.

- How many seeds germinated?
- Can you count the leaves on the sprouts? Can you classify the type of plant by the number of leaves (cotyledons)?

Seed Germination Hypothesis & Experiment

Did all of your seeds germinate? Formulate a hypothesis as to what it would take to make these seeds germinate. Do you think the seeds might need sun, dark, more water, less water, heat, cold, etc.? Perform an experiment to test the results.

Seed Olympics

- With seeds the students have collected, have them organize them into the category of dispersal method that best fits each seed.
- **Flyers** – Have a few students stand in a line and blow their seed to see how far each goes.
- **Floaters** – Starting with pans of water of equal length, have each student start their seed at one end and time how long it takes their seed to float to the other end.
- Design competitions for other types of seeds and try them out!

Extra Credit

Design and build a seed that might travel through space and go from one planet to another.

- What might the seed look like? Construct or draw a picture of the seed.
- What would happen if your seed came to the Earth?
- How would it arrive? Would it arrive on land or water?
- Would it burn up in the atmosphere? Might it be attached to a meteorite?
- Be creative!

Other Discussion Points

- Seeds and fruit are used for purposes other than plant reproduction. *Eating: corn, peanuts, etc. Wearing: cotton,*
- There are plant reproduction methods other than seeds and fruit. *Fern spores, runners, cloning*
- Humans have modified nature's seed dispersal methods.
- Some plants don't reproduce by seeds: runners, suckers, spores, bulblets,
- Compare seed bearing plants with non-, why/why not? What are clones? Is bio-diversity important?