Blooming Botanists
EDUCATOR GUIDE

Thank you for registering for the Blooming Botanists field trip at New England Botanic Garden at Tower Hill. This guide provides an overview and introduction to the program. The optional pre- and post-visit activities on the following pages will support your students' learning during the program and will help to extend their knowledge beyond your trip. Prior to your visit you are not mandated to complete any specific lessons or units of study.

WHAT'S INSIDE

Overview

During this guided program your students will get up close and personal with plants of all shapes and sizes. Students will learn about the life cycle of plants and their unique characteristics and traits as they tour the gardens and participate in hands-on activities. We recommend you complete the pre- and post-visit activities on the following pages to enhance your visit and support the classroom integration of the concepts addressed during this program.

Throughout the 90-minute field trip, Teacher Naturalists will guide small working groups of no more than 15 students through the gardens and trails. Students will be encouraged to make observations, explore, and ask questions throughout. Each student will be provided with a hand lens, clipboard, and field notebook to use during their visit. Teacher Naturalists will engage students using stories, investigations, experiments, and games.

Learning Objectives

Students will...

- Learn that flowering plants have unique and diverse life cycles.
- Complete a flower dissection to learn the reproductive parts of the plant and their purpose.
- Know the difference between inherited characteristics and ones influenced by the environment.

Background

Most plants follow five similar stages in their life cycles: seed, germination, growth, reproduction, and seed dispersal. Plant species will look different at each stage of their life cycle. Flowering plants reproduce through the process of pollination, typically with the assistance of pollinators like insects and birds. All plants have traits that they inherit from their parent plants, such as shape, color, patterning, and number of petals. As plants live they develop additional traits that are influenced by environmental factors, like weather and other living things.

Vocabulary

Life Cycle: the series of stages that organisms go through during their life.
Germination: when seeds begin to sprout roots and leaves after getting water and sunlight.
Sprout: the new plant growth that happens after germination.
Seedling: a young plant with a stem less than 1 inch in diameter.
Sapling: a young tree with a trunk between 1-6 inches in diameter.
Flowering: an adult plant that has reached the time of year when it grows flowers.
Fruiting: after pollination the plant grows fruit, which is the ripened ovaries of a seed bearing plant.
Pollination: the transfer of pollen from the stamen of a plant to the pistil of another.
Reproduce: when a plant is able to create more plants, flowering plants do this through pollination.
Inherited Traits: characteristics that come from a parent plant and are passed down through genes.
Environmental Traits: characteristics that are influenced by the environment.

IN ALLIGNMENT WITH THE 2016 MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING CURRICULUM FRAMEWORKS

Standards

GRADE 3

- 3-LS1-1. Use simple graphical representations to show that different types of organisms have unique and diverse life cycles. Describe that all organisms have birth, growth, reproduction, and death in common but there are a variety of ways in which these happen.
- 3-LS3-1. Provide evidence, including through the analysis of data, that plants and animals have traits inherited from parents and that variation of these traits exist in a group of similar organisms.
- 3-LS3-2. Distinguish between inherited characteristics and those characteristics that result from a direct interaction with the environment. Give examples of characteristics of living organisms that are influenced by both inheritance and the environment.

GRADE 4

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

Pre-Visit Activity Guide

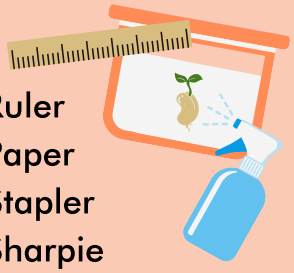
The following optional pre-visit activities and resources are designed to support the understanding of concepts that will be addressed during the Blooming Botanists program.

GROWING JOURNAL

Students will practice math and literacy skills as they germinate a lima bean seed and track its growth through the first stages of its' life cycle.

MATERIALS

- Lima Beans
- Ziploc Bags
- Paper Towels
- Spray Bottle
- Ruler
- Paper
- Stapler
- Sharpie



Each student will create their own lima bean germination kit and growth journal.
(TIP: to speed up the growth process, presoak the lima bean seeds overnight).

1. Give each student a plastic bag, a lima bean seed, and a half sheet of paper towel.
2. Instruct students to loosely fold their paper towel around their lima bean seed and place it in the plastic bag.
3. Let each student dampen the paper towel using a spray bottle.
4. Write student names on each bag with a sharpie and hang bags near a window.
5. Give each student 5 sheets of copy paper and have them fold the sheets in half.
6. Staple all pages together with two staples on the center fold. Optional: decorate covers.

Have students make hypotheses about how their plants will grow. Check back on the experiment daily or weekly to make observations and track the growth of the bean, the leaves, and the roots. Compare plant growth and discuss why the results might be different.

FLOWER TRAITS

Students will learn what an inherited trait is and that all plants have inherited traits that have been passed down from their parent plant.

MATERIALS

- Paper
- Pencils
- Markers
- Flower Photos

Discuss what an inherited trait is, explaining that we have physical characteristics that we get from our parents and so do plants. Common inherited plant traits include flower color, petal shape, odor, stem length, leaf pattern, and seed shape. As a class, observe and brainstorm some inherited traits of a flower of your choosing.

Each student (or group of students) will research a flower and create a poster about their flowers inherited traits. These posters can be used as a tool to categorize and identify different flowers.

1. Assign each student a flower and give them several photos of the same flower to study.
2. Give students a piece of copy paper and have them divide it into fourths. Writing the words "flower color", "flower shape", "number of petals", and "petal shape".
3. Have students observe their flower photos and fill in each section of their sheet.
4. Ask students to research more about their flower, including seeds, smell, and height.
5. Give each student a piece of poster paper and have them draw their flower or trace their photo onto the center of the paper.
6. Have students label the traits of their flower onto their poster, adding additional drawings and notes about what unique characteristics their flower has.
7. Display the Flower Posters around the room as a class flower identification guide.

Post-Visit Activity Guide

The following optional post-visit activities and resources are designed to reinforce concepts that were addressed during the Blooming Botanists program. We would love to see your students' work! Please share with us by mail or email us at youtheducation@nebg.org

POLLINATION PLAY

Students will practice literacy and science skills as they deepen their understanding of the process of pollination through dramatic play.

MATERIALS

- Paper
- Pencils
- Art Supplies
- Recycled Materials

Review the parts of a flower and their functions using the student notebooks from the Blooming Botanists program. Discuss the process of pollination as a class and explain that we will be writing a short play about cross-pollination and then we will work together to act it out. Depending on your class size you may want to separate your class into smaller groups to each make their own short pollination play.

1. Introduce the concept of storyboarding with the sections: beginning, middle, and end.
2. Write the script as a group, explaining that we must have several flowers and pollinators as characters in the play. Each play must also show pollen traveling from one flower to another flower.
3. Have students create props for their play using art supplies and recycled materials. Make sure the flowers are designed with all their parts: pistil, stamens (with pollen), petals, stem, leaves, and roots.
4. Have students perform their pollination play.

ADAPT & CHANGE

Students will conduct experiments on their bean plants, from the pre-visit activity, to learn how plant traits change depending on their environment.

MATERIALS

- Pencil
- Journal
- Bean Plant

Discuss plant traits with the students and review what an inherited trait is and what an environmental trait. Explain that environmental factors can impact how a plant grows and plants can adapt to become better suited for their environment. Weather, animals, and people can all change a plant's traits.

Explain that we are going to alter the environmental conditions for our bean plants to see how they adapt and change. Brainstorm with students some scenarios to test out or use the list below.

- Flip the bean plant bags upside down.
- Place a couple rocks in the bag with the plant.
- Place bean plants in an area where they cannot get any sunlight.
- Cover one of the leaves of the bean plant with aluminum foil.
- Rotate the bean plant away from the light.
- Stop watering the plant.
- Place the plant in a pot with soil.

Make hypotheses and note the new plant traits. Use growing journals to track how the plants adapt to the new environmental conditions.

EDUCATOR RESOURCES

- Garden Adventures: Exploring Plants with Young Children by Sarah Pounders
- Field Guide to Wildflowers by National Audubon Society
- Plant by David Burnie