



AMAZING ADAPTATIONS

EDUCATOR GUIDE

Thank you for registering for the Amazing Adaptations 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 help 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

Vocabulary & Standards: Page 2

Pre-Visit Activity Guide: Page 3

Post-Visit Activity Guide: Page 4



OVERVIEW

During this guided program your students will compare plant and animal life across habitats and uncover the physical or behavioral adaptations that aid in survival and make them uniquely suited for their environment. They will also understand that all plant and animal species depend on reproduction for their species to survive. We recommend you complete the pre- and post-visit activities on the following pages to enhance your visit and support the 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 to various habitats in search of various plant and animal species. 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 a combination of stories, investigations, games, and writing activities.

LEARNING OBJECTIVES

Students will...

- Identify adaptations that plants and animals have to help them survive.
- Learn that all plant and animal species reproduce to continue their species.
- Make field observations to understand how living things adapt to their environments.

BACKGROUND

Plants and animals have physical and behavioral adaptations that allow them to survive and reproduce in their specific habitats. Animals may evolve and develop claws for climbing, fur for warmth and camouflage, keen eyesight to see predators, webbed feet for swimming, etc. Animals also have specific behaviors that allow them to survive including migration, hibernation, communication through calls or dances, etc. Plants have physical adaptations that allow them to photosynthesize and reproduce, these include the production of nectar and pollen, design of root structure, seed dispersal strategies, and more.

VOCABULARY

Adaptation: a physical feature or a behavior that helps an organism survive.

Survive: to be alive and healthy.

Habitat: is a place where plants or animals live and can find the things they need to survive.

Reproduce: is when plants and animals make new offspring.

Pollination: is the transfer of pollen from the stamen of a plant to the pistil of another plant, often with the help of pollinators or wind. Pollination is how flowering plants reproduce.

Seed Dispersal: the process of moving seeds from one place to another through wind, water, animals, exploding seed pods, or gravity. This allows seeds to leave the parent plant to find a new space to grow.

Photosynthesis: is the process by which plants make their own food (glucose).

Cuticle: is a waxy covering on the leaves of succulents that keeps in moisture.

Deciduous: trees that have broad leaves that shed to prepare for winter.

Evergreen: trees have needles and stay green year round.

Tropism: is a physical response to environmental conditions.

Epiphytes: are plants that grow with their roots in the air.

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

STANDARDS

GRADE 3

- 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-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.
- 3-LS4-3. Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive.
- 3-LS4-5. Provide evidence to support a claim that the survival of a population is dependent upon reproduction.

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 Amazing Adaptations program.

ADAPTATION FASCINATIONS

Students will learn about adaptations of local plants and animals.



MATERIALS

Poster board
Markers

Introduce or review what an adaptation is and form a definition together as a class. Explain that an adaptation is something that helps a plant, or an animal survive; like having a superpower.

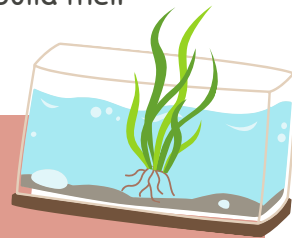
Break students up into small groups. Assign each group a local plant or animal to study including gray squirrels, chickadees, white pines, sugar maples, white oaks, green frogs, eastern newts, monarchs, common milkweed, and more. Provide magazines, books, field guides, or online resources to help groups research facts about their species.

Provide each group with a large poster board and challenge students to create a Pokémon style trading card of their plant or animal. On their poster students should answer the following questions:

- What habitat does your organism live in?
- What physical and behavioral adaptations help your organism survive in its' habitat?
- What is the lifecycle of your organism?
- What physical features or behaviors help your organism complete its lifecycle (reproduce)?
- How do plants and animals depend on each other for survival?

AQUATIC ADAPTATIONS

Students will explore adaptations of aquatic plants and be challenged to build their own plant model that can survive in an aquatic habitat.



MATERIALS

Computer	Stapler	
Scissors	Testing Bin	String
Craft foam	Pipe cleaners	Rocks

Ask students to name the things plants need to survive (light, carbon dioxide, water, nutrients, and space). Review what an adaptation is and as a group brainstorm what adaptations plants have to help them survive and reproduce. Explain that today we are going to learn about adaptations of aquatic (water dwelling) plants.

- Ask students to list plants that live in water and discuss challenges they might face.
- Assign each student, or group of students, an aquatic plant to research: water lily, wild rice, American lotus, cattail, duckweed, water hyacinth, mosaic plant, or water lettuce.
- Discuss what adaptations their plants have.
- Challenge students to build their own aquatic plant model using various art supplies.
- Prepare the water testing bin by filling it with water and placing rocks on the bottom.
- Invite student to test their plant in the bin by submerging it in water and locking the roots under the rocks or leave leaf floating on top.
- Discuss findings as a class and determine what physical adaptations were successful in helping their plant survive.

EXTENSION

1. Graph results from the water plant challenge. Which plant design was able to withstand the water habitat the best?
2. Analyze the results as a group.

POST-VISIT ACTIVITY GUIDE

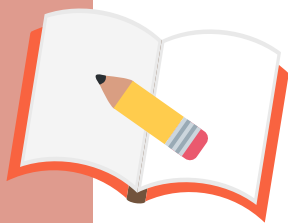
The following optional post-visit activities and resources are designed to reinforce concepts that were addressed during the Amazing Adaptations program. We would love to see your students' work! Please share with us by mail or email us at youtheducation@neb9.org

NATURE NARRATIVES

Students will write a short story based off the adaptations of the new species of plant they created during the Amazing Adaptations program.

MATERIALS

Pencils & Paper
Field Trip Notebook
Story Map Worksheet



Return field notebooks to each student and have students turn and talk about the plant they designed and what its habitat is like.

Explain that they will be creating short stories that feature the new species of plant they developed.

1. Read aloud a book that features a plant, such as the Cactus Hotel or the Giving Tree.
2. Hand out a Story Map worksheet to each student and review how to write a story.
3. Give students time to fill in their Story Map and explain that they can use inspiration from the story they just heard.
4. Review each students Story Map before they start writing to make sure it is complete.
5. Ask students to write at least 6 pages of their story, with 1–3 sentences per page.
6. Give students time to illustrate their stories using pencils or art supplies.
7. Invite students to share their stories with the class by reading aloud themselves or asking you to read aloud for them.

AMAZING INVENTIONS

Students will create an original invention inspired by plant and animal adaptations.

Return field notebooks to each student and have students turn and talk about the adaptations they learned about.

MATERIALS

Pencil
Paper
Field Trip Notebook



Explain that we will be using the data we collected to create a new invention or solve a problem. Explore the online resources at biomimicry.org, or read articles or stories to learn about some interesting inventions and creations inspired by nature.

Have students work independently or in groups to dream up a new invention inspired by some of the amazing adaptations they learned about. Go through the design process and have students problem solve and make revisions. Hang completed designs around the room and host a gallery walk.

EDUCATOR RESOURCES

- Project Wild by the Council for Environmental Education
- The Curious Naturalist by John Mitchell & Massachusetts Audubon Society
- The Biomimicry Institute at biomimicry.org

STORY BOOKS

- Cactus Hotel by Brenda Z. Guiberson
- Invented by Animals by Christian Dorion
- Mimic Makers: Biomimicry Inventors Inspired by Nature by Kristen Nordstrom
- Biomimicry: Inventions Inspired by Nature by Dora Lee
- Beastly Bionics: Rad Robots, Brilliant Biomimicry, and Incredible Inventions Inspired by Nature by Jennifer Swanson
- Wild Buildings & Bridges: Architecture Inspired by Nature by Etta Kaner