



ADAPTATION FASCINATIONS

EDUCATOR GUIDE

Thank you for registering for the Adaptation Fascinations 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.

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OVERVIEW

During this guided program your students will explore adaptations that increase an organism's chance for survival and reproduction focusing on seed dispersal in fall and pollination in spring. Students will categorize the various interspecies relationships that these adaptations support and create within an ecosystem including parasitism, mutualism, competition, and predation as well as how those relationships transfer energy within an ecosystem between producers, consumers, and decomposers. We recommend you complete the optional 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 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...

- Understand how energy cycles through an ecosystem.
- Make observations to understand how organisms adapt to their environments.
- Identify species relationships and understand how they impact the ecosystem.

BACKGROUND

All living things have specific adaptations that aid in their survival and reproduction. These adaptations are observed in specialized structures or behaviors which are understood through the process of natural selection, or how organisms evolve into their most advantageous form over time. Understanding these adaptations is necessary to uncovering the various ways in which the abiotic and biotic components of an ecosystem are linked. These relationships between organisms can have neutral, positive, or negative impacts and affect the physical and behavioral adaptations of different plant and animal life.

VOCABULARY

Ecosystem: a community of living (biotic) and non-living (abiotic) things.

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

Dispersal: how plants spread their seeds.

Pollination: the process of plants getting fertilized in order to make seeds.

Reproduction: when plants and animals make new offspring.

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

Cellular Respiration: how organisms break down stored energy in food for fuel.

Producer: an organism that makes its own food; the first level of the food chain.

Consumer: an organism that gets energy by eating producers or consumers.

Decomposer: an organism that gets their energy from breaking down dead things.

Symbiosis: a close relationship between dissimilar organisms over a period of time that can be beneficial, harmful, or neutral.

Mutualism: a species relationship in which both organisms benefit.

Parasitism: a species relationship in which one species benefits at the expense of another.

Predation: a relationship in which one species consumes the other.

Competition: when two or more species, or two or more of the same species, conflict with each other over limited resources.

Commensalism: when one species benefits while the other neither benefits or is harmed.

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

STANDARDS

- 7MS-LS1-4: Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants.
- 7MS-LS2-2: Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic, and mutually beneficial and that these interactions are found across multiple ecosystems.
- 7MS-LS2-3: Develop a model to describe that matter and energy are transferred among living and non living parts of an ecosystem and that matter and energy are conserved through these processes.

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 Adaptation Fascinations program.

ADAPTATION INVESTIGATION

Students will explore the subject of species adaptations and their role in supporting survival.

MATERIALS

Pencils
Paper
Field guides



Review the subject of adaptations by asking students for a definition as well as some examples from various species.

Have each student select a species without sharing what it is and write a list of five adaptations that the particular plant or animal exhibits on a notecard. These can be behavioral or physical characteristics that the organism has to help it survive and reproduce.

Divide the class in half and have each group shuffle their organism cards together. Taking turns, have one person from each team select a card from the opposing team, stand up, and read the first adaptation on their card. That student's team will then have 1 chance to guess the organism. If their guess is incorrect, repeat this process with the next adaptation on their card. If immediately guessed correctly, award five points. For every additional adaptation shared, award one less point on a correct answer.

Take turns between groups until all organism cards are read. After completing the game, have students explain how their species adaptations help it to survive. Invite students to share what they wrote with a partner or with the class.

READY, SET, ADAPT!

Students will think creatively about what plants need to successfully survive and reproduce.



MATERIALS

Paper
Pencils
Colored Pencils
Poster board
Recyclables
Tape/Glue

Review with students the basic needs of a plant (CO₂, water, nutrients, sunlight). Visit the schoolyard or local greenspace and allow students to free explore; observing the plant life present in their area of study. Challenge students to compare and contrast different plant species and study the basic morphology of one species through discussion or botanic illustration. Students should communicate how these differences help plants survive in different environments.

Return to the classroom and split the class into small teams. Explain that they should take inspiration from their field notes and observations to invent a new species of plant. Allow students to create a 2D model of their plant as a poster, or a 3D model using recyclables, along with a summary of the habitat it lives in. Have students identify unique adaptations that their plant exhibits in order to be better suited towards their imagined environment.

EXTENSION

1. Come up with an environmental impact, either naturally occurring or a result of human activity, that threatens the habitat of the students' imagined habitats. Ask students how their plant would survive these new conditions and what adaptations they would rely on in order to achieve the goal of survival.
2. Have each group share with the class how their plant managed to overcome these new environmental conditions.

POST-VISIT ACTIVITY GUIDE

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

RELATIONSHIP WEB

Students will create a web of life poster based off the species they discussed and encountered during the Adaptation Fascinations program.

MATERIALS

Pencils & Paper
Field Trip Notebook
Poster Board
Markers



Return field notebooks to each student and have students turn and talk about the species they included on the Adaptations and Relationships pages of their notebook.

Explain that they will be creating relationship webs that feature the species they included in their notebooks.

1. Break students up into small groups of 2–4 and have them create a list of at least ten species they will include in their web. These can be drawn from their notebooks or other species that were discussed during the field trip.
2. Provide students with poster board and have them first plot out the names of each species and then draw arrows between them signifying relationships. Students should label what type of relationship is being represented.
3. Allow students to decorate their webs with depictions of the species and the relationship that is being exhibited.
4. Invite students to share their posters with the class either by presenting them directly or hung up on the walls as a gallery walk.

AMAZING INVENTIONS

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

MATERIALS

Field Trip Notebook
Pencil & Paper



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

Explain that we will be using the notes we took to create a new invention or solve a problem. Have students explore the online resources at biomimicry.org, reading articles to learn about some interesting inventions and creations inspired by specific species and their adaptations.

Have students work independently or in groups to dream up a new invention inspired by one of the adaptations they learned about. Review the engineering design process and have students follow the first few steps: Ask, Research, Imagine, and Plan. During the planning process, have students draw out a sketch of their design and write up a brief summary of how it mimics an adaptation of their living organism.

EXTENSION

- If there is time, have students make a prototype of their design and present their design concept to the class through a visual presentation or poster.

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