



No Monkeys No Chocolate

4th grade

Standards

4: GPS.S4L2.a; GPS.S4L2.b

4: NGSS 4.LS1.1 3: NGSS 3.LS4.2

Time

Supplies

For each student

- Scavenger Hunt Form (with clipboard and pencil)

For the class

- Book: *No Monkeys, No Chocolate* by Melissa Stewart and Allen Young

Chocolate making activity

- Cocoa powder (2-1/4 cups)
- 1 cup unrefined coconut oil (melted)
- Vanilla stevia drops to taste (substitute agave or maple syrup)
- Optional: cocoa nibs or other add-ins
- Mixing Bowls (4)
- Spoons (4)
- Cookie sheet with edges, candy molds, or zip top bags
- Optional: Paper lollipop sticks
- Freezer (or refrigerator)

Birds and Worms simulation activity

- Box of three colored pasta
- Pad and paper
- Soccer cones to define area for game
- Pipe cleaners or chenille sticks of various colors

Garden Connection

Students will go on a garden scavenger hunt looking for examples of organism adaptation.

STEM Connection

“[What’s Invasive?](#)” app can be used to identify and collect data on removal of non-native, invasive species that upset the balance of co-adapted species

which are native to an area.

Overview

Students will read a book about interrelationships (co-adaptations) in an ecosystem that contribute to the survival of both monkeys and cocoa trees; role play a simulation activity to understand how camouflage is an adaptation that contributes to survival; create models of insects that are adapted to survive in the garden; go on a garden adaptation scavenger hunt; research co-adaptations; and make chocolate bars from cocoa powder.

Essential Question

Why is it that if we didn’t have any monkeys, we wouldn’t have any chocolate? How are monkeys and chocolate connected?

Engaging Students

Students will taste cocoa powder and make chocolate bars. Students will also participate in a simulation activity that discusses organism adaptation.

Exploration

Students will participate in a garden scavenger hunt looking for plant adaptation. Students will research co-adaptations.

Explanation

Through debate, students will identify adaptations in organisms.

Environmental Stewardship

Students will remove invasive species of plants.

Evaluation

Students should be able to articulate that adaptations can be structural, physiological or behavioral.

Extension

A Garden Insect model-making game is provided.

Standards

Georgia Performance Standards in Science

S4L2. Students will identify factors that affect the survival or extinction of organisms such as adaptation, variation of behaviors (hibernation), and external features (camouflage and protection).

- a. Identify external features of organisms that allow them to survive or reproduce better than organisms that do not have these features (for example: camouflage, use of hibernation, protection, etc.).
- b. Identify factors that may have led to the extinction of some organisms.

Next Generation Science Standards

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

3.LS4.3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Teacher Background Information

- Secret Note Worksheet for activity: <http://www.melissa-stewart.com/pdf/Choc%20Secret%20Note.pdf>
- Other books on relationships between plants and animals in an ecosystem: <http://www.melissa-stewart.com/pdf/Comparing%20Texts,%20Making%20Connections.pdf>
- Three Ingredient (Relatively Healthy) Chocolate Bars: <http://chocolatecoveredkatie.com/2012/01/15/three-ingredient-chocolate-bars-1/>
- “What’s Invasive?” web and mobile device app for identifying and collecting data on invasive species removal: <http://whatsinvasive.com/>

Teacher Preparation

Divide ingredients for chocolate bars into quarters (1/2 cup + 1 tbs cocoa powder and ¼ cup coconut oil). Obtain materials on Supply list.

PROCEDURES FOR LESSON ACTIVITIES

Day 1

Engagement

Chocolate and Monkeys (30 min)

Read *No Monkeys, No Chocolate*, by Melissa Stewart, to the class.

Storytime guide: <http://www.melissa-stewart.com/pdf/Choc%20Storytime%20Guide.pdf>

Or ask the class to perform this Readers’ Theater version:

http://www.charlesbridge.com/client/client_pdfs/downloadables/NoMonkeysNoChocolate_ReadersTheater.pdf

Refer to the Teacher Guide for key points in the story:

http://www.charlesbridge.com/client/client_pdfs/downloadables/NoMonkeysNoChocolate_TeachersGuide.pdf

Facilitate a discussion of interrelationships featured in the book.

Just Chocolate (30 min)

Divide class into small groups and allow students to taste cocoa powder (unsweetened) before making four batches of [Three Ingredient Chocolate Bars](#) by stirring the ingredients together, pouring into flat containers, and cooling in the fridge or freezer.

1/2 cup plus 1 tbsp cacao or cocoa powder

4 tbsp unrefined coconut oil, melted

Syrup or honey, to taste

[Birds and Worms from Project Learning Tree](#)

While the chocolate bars are hardening, organize students to participate in a simulation activity outside. Distribute equal numbers of three colors of pasta on the ground in a grassy area near the garden. Tell students that they are each going to role-play the part of a hungry robin looking for worms, represented by pasta. Line the class up on one side of the playing area (defined by soccer cones) and tell them to collect as many worms as possible, in the limited time available. Start the action by calling out “hunt” and then “stop” after a few seconds. At the end of the round, ask each student to place his or her worms to a bucket while calling out the numbers of each color. Record the numbers on a large chart (such as the one that is attached) under round one. If there is a difference in the number of “worms” of each color that has been found and “eaten”, ask why this might be so. (Numbers of pasta pieces of each color are the same. Depending on the season and the predominant color of ground cover, the type of worm least collected is typically the color which provides the best camouflage). Play additional rounds and compare the numbers of worms of each color that are collected. (The more rounds, the fewer contrasting color worms are collected and the more camouflaged worms are collected). Add the totals for each color worm in the end, and determine whether the camouflage was an effective adaptation that contributed to the survival of the worm species. Discuss how adaptations come about not in a single generation and not by choice, but as the result of a different trait in an offspring (from genetic mutation or sexual reproduction) that increases its chances to survive and reproduce. Over many generations, traits that are less well adapted to survival (including colors that contrast with the environment) can disappear from a population because those “worms” do not survive long enough to reproduce. Other traits (such as a camouflaged color) become more prominent in a population because those “worms” are the ones that survive to reproduce and pass on their coloration to the next generation.

Exploration

Plant Adaptation Scavenger Hunt in the Garden

Of course animals are not the only ones that can adapt. Plants adapt too, as the cocoa plant adapted to having seed spread by monkeys. Divide students into discovery teams of two – four and provide a time limit for searching for plant adaptations, using the attached Scavenger hunt list. Use a pre-arranged signal to call the class back together. Analyze and discuss results.

Research on Co-Adaptations (also known as co-evolution)

Divide the class into discovery teams of three or four and allow each team to choose a topic to research:

- The interrelationship of figs and wasps
- The interrelationship of longleaf pines, wiregrass, gopher tortoises and fire
- The interrelationship of monarch butterflies, milkweed plants and bluejays
- The interrelationship of honeybees and the particular flowers they pollinate
- The migration of monarch butterflies
- The migration of whooping cranes
- Other adaptation of student choice

After completing and presenting research, allow students to search again in the schoolyard for evidence of interrelationships and to take pictures of their finds, which they will share with the class.

Explanation

Given a physical structure or physiological trait or a behavior, students will argue whether this characteristic is an adaptation. (Adaptations are variations or changes that arise from mutation or mixing of genes through

sexual reproduction, resulting in a trait or characteristic that confers an advantage for survival and reproduction, and is therefore passed on to the next generation. Adaptations are random and do not necessarily lead to the “best” possible design of an organism, but outperform the available alternatives. Adaptations are localized and can provide advantages in response to environmental pressures and events. Adaptations take place over multiple generations (not during one lifetime) and are the result of inherited advantages, not willful choices.

Environmental Stewardship

Remove invasive species of plants that upset the balance of plant and animal co-adaptations, developed over many generations. The web and mobile device app: “What’s Invasive?” can be used to collect and post data about a project that students design and implement in the schoolyard.

Evaluation

Students should be able to articulate that adaptations can be structural or physiological or behavioral, and that each adaptation is retained by the group because it has enhanced survival and reproduction (and because those individuals without the adaptation may be more likely to die before reproducing).

Extensions

- *Garden Insects*

Divide the class into two halves and allow students to choose any color pipe cleaner or chenille stick from which they will fashion an insect. Send each half of the class to a separate garden to hide their insects among the plants. The exchange locations of the two groups and ask students to collect as many pipe cleaner insects as they can find without damaging plants to do so. Ask students whose insects were not found to show them and describe their adaptive traits (ie coloration, size, mimicry, part of life cycle underground, etc)

- *Make more chocolate.*

Birds and Worms Data Chart

Round #	Reds eaten	Greens eaten	Yellows eaten
1			
2			
3			
Total			

Note: the colors that were least collected and least eaten are best adapted to survival because they were not found by the predator robins.

Adaptation Scavenger Hunt in the Garden

Look for examples of any of the following types of adaptations among plants in the garden. Draw or describe an example of each. (Hint: some adaptations, such as migration, may not be obvious during one observation period).

Protective coloration to stay hidden from predators: _____

Protective adaptation to keep from being eaten: _____

Attractive coloration to be seen by mates: _____

Adaptation to encourage pollination: _____

Adaptation to make photosynthesis easier: _____

Adaptation to spread seeds: _____

Co-adaptation that benefits two different species: _____

Adaptation for surviving cold weather: _____

Adaptation for surviving drought: _____

Adaptation to survive in a crowded garden or forest, with little sunlight



Assessment for No Monkeys, No Chocolate

Student Name(s): _____

Date: _____

<p style="text-align: center;">Level of Mastery</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">→</p> <p style="text-align: center;">Benchmark or Performance Measure</p>	 <p style="text-align: center;">EMERGING Not yet proficient 1 point</p>	 <p style="text-align: center;">COMPETENT Partially proficient 4 points</p>	 <p style="text-align: center;">PROFICIENT Mastered task 5 points</p>	<p style="text-align: center;">TOTAL POINTS</p>
<p>No Monkeys No Chocolate book</p>	<p>Student did not contribute to discussion about the book.</p>	<p>Student contributed to discussion about the book.</p>	<p>Student contributed to discussion about the book and asked good questions for further student investigation.</p>	
<p>Birds and Worms/ Adaptation Scavenger Hunt</p>	<p>Student played Birds and Worms and went on the Adaptation Scavenger Hunt</p>	<p>Student played Birds and Worms and recorded results for each round; went on the Adaptation Scavenger Hunt and found at least three examples of adaptations</p>	<p>Student played Birds and Worms and recorded results for each round; went on the Adaptation Scavenger Hunt and found at least five examples of adaptations</p>	
<p>Research on Co-Adaptations and Photos of Co-Adaptations in the Garden</p>	<p>Student and partner presented research to class. Student could not find an example of co-adaptation in the garden.</p>	<p>Student and partner presented research to class. Student found and photographed an example of co-adaptation in the garden or schoolyard.</p>	<p>Student and partner presented research to class. Student found and photographed an example of co-adaptation in the garden or schoolyard.</p>	
<p>Environmental Stewardship: Removal of Invasive Species from the Schoolyard</p>	<p>Student can identify and helped remove invasive species</p>	<p>Student can identify and helped remove invasive species, and can explain how non-native invasive species can upset the balance of native species that are co-adapted</p>	<p>Student can identify and helped remove invasive species, and can explain how non-native invasive species can upset the balance of native species that are co-adapted; and recorded work on What's Invasive? app</p>	