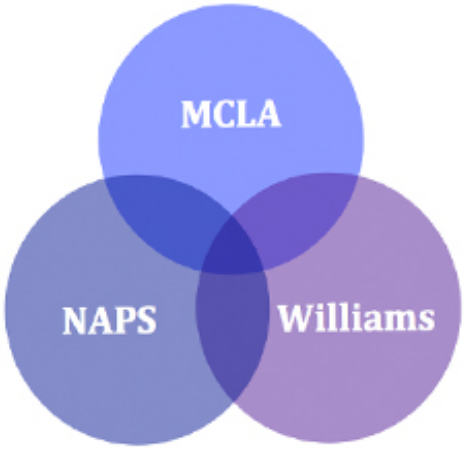
# T2L Curriculum Unit




# Teach To Learn

A collaboration between
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North Adams Public Schools

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# Adaptations and Heredity Gr 3

BY NC SA

# Adaptation and Heredity

## Life Science/Grade 3

This unit engages students in an exploration of how changes to an environment or habitat affect the ability of animals and plants to survive and prosper. This unit explores these major themes: adaptation, heredity, evolution, and natural selection. Students will learn that animals and plants inherit traits from their parents; that adaptation leads to variation in those traits; traits can be influenced by the environment; some traits are learned and learning is acquired and therefore not an adaptation, and natural selection guides evolution. The unit includes activities that explore how societal actions impact habitats and the plants and animals living there.

The following lessons incorporate hands-on experiments, data collection, and discussions with peers and teachers, and have been adapted from DESE's 3rd grade Model Curriculum Unit *Survival of Organisms* and the from the Williams' Elementary Outreach Program Adaptation Unit, among others. In addition to successfully engaging with the content, the goals of this unit are to foster intellectual curiosity and provide hands-on, real world scientific experiences that spark intellectual curiosity.

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This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

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# UNIT PLAN

| Stage 1 – Desired Results | | |
|---|---|---|
| | ***Meaning*** | |
| Note: Both the new MA draft science standards and the current science standards are referenced below. *The current standards are italicized below and throughout the lessons.*<br><br>3-LS1-1. Use simple graphical representations to show that species 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.<br><br>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.<br><br>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 | **UNDERSTANDINGS** **U**<br>***Students will understand that…***<br><br>• Changes in an environment can affect the survival of animals.<br>• Specific bird beaks are adapted to eat a certain type of food.<br>• What type of food different birds eat are based on the shape of their beak.<br>• Hypothesize what would happen to a bird population if its environment changed.<br>• Variations in characteristics among individuals of the same species may provide advantages in surviving.<br>• Use evidence to support the explanation that the environment influences traits.<br>• Analyze and interpret data to provide evidence for conclusions.<br>• Some animals and plants survive well, less well or do not survive in an environment.<br>• Changes in an environment can affect the survival of different kinds of plants and animals. | **ESSENTIAL QUESTIONS** **Q**<br><br>**Q1. How do living things (animals and plants) adapt to their environment so they are better able to survive?**<br><br>**Q2. How do people affect the environment of living things (animals and plants)?** |

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| environment.<br><br>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.<br><br>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.<br>3-LS4-4. Analyze and interpret data about changes in the environment in an area and describe how the changes may affect the ability of organisms that live in that area to survive and reproduce.<br><br>*3-5 LS.5 Differentiate between observed characteristics of plants and animals that are fully inherited (e.g. color of flower, shape of leaves, color of eyes, number of appendages) and characteristics that are affected by climate or environment (e.g. browning of leaves due to too much sun, language spoken).*<br><br>*3-5 LS.6 Give examples of how inherited characteristics may change over time as adaptations to changes in the environment* | ***Objectives: Knowledge & Skills***<br>**Students will be able to….**<br>**Knowledge**<br>1. Compare and contrast acquired and inherited traits.<br>2. Give examples to show that all living things have traits that are inherited and traits that are acquired.<br>3. Recognize that different types of animals can have different responses to changes in an environment.<br>4. Recognize that different animals have different needs that may or may not be met by a particular environment.<br>5. Describe the process of evolution by relating how adaptations made organs over millions of years allowed whales to move from the land to the water.<br>6. Give one example of how animals and plants depend on each other for survival.<br>7. List how changes in the environment impact the survival of the plants and animals that live there.<br>8. Recognize that human activity can lead to environmental changes.<br><br>**Skills**<br>9. Create a bar graph to show fluctuations in habitat components and the population of a model animal (deer).<br>10. Collect and record data to determine which type of beak is best suited for which type of food. |

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| *that enable organisms to survive, e.g. shape of beak or feet, placement of eyes of head, length of neck, shape of teeth, color.*<br>*3-5 LS.7 Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).*<br><br>**Related Earth Science Standards**<br>K-2-ESS3.C Human impacts on Earth systems. Things people do can affect the environment, but they can make choices to reduce their impacts.<br><br>3-5-ESS3.C Societal activities have had major effects on land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments<br><br>ESS2.E Living things can affect the physical characteristics of their environment.<br><br>**Mathematics**<br>3.MD.B.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. | |

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| **Literacy**<br>W3.2.Write informative/explanatory texts to examine a topic and convey ideas and information clearly.<br><br>**Technology**<br>G3-5: 2.7 Explain that some Web sites and search engines may include sponsored commercial links. | |

## Stage 2 – Evidence

| Evaluative Criteria | Assessment Evidence |
|---|---|
| **Pre-unit Assessment (if any)** | **CEPA: Designing a Bird: An Evidence-Based Rationale**<br>Students "create" their own bird-like creature and develop a scientific argument that supports their chosen beaks and feet based on what their created bird eats and where it lives. |

## Stage 3 – Learning Plan

***Prior grade level knowledge (review if necessary)***

Habitats and environment

Use principles of the physical world to analyze living systems

Use evidence and reasoning to develop scientific claims and engage in discussions of scientific and technical topics

*Adapted from Massachusetts Department of Elementary and Secondary Education's Model Curriculum Unit Template. Originally based on Understanding by Design 2.0 ©2011 Grant Wiggins and Jay McTighe. Used with Permission, July 2012.*

# Lesson 1: Oh Deer!

## BACKGROUND

### Overview of the Lesson

Students will explore the impacts of changes to an environment on the survival of deer populations through game play. Students will learn that habitats provide resources that allow plants and animals to survive and reproduce and when the environment changes it can adversely impact the organisms that rely on it. Students will also learn that a habitat can be large or quite small, as long as it provides the components for survival and reproduction. This lesson is adapted from http://www.projectwild.org/documents/ohdeer.pdf

****This lesson will require the use of a large space, so make sure to coordinate with the teacher ahead of time to secure a large space for the activity.****

### Focus Standard(s)

**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-LS4-4.** Analyze and interpret data about changes in the environment in an area and describe how the changes may affect the ability of organisms that live in that area to survive and reproduce.
***3-5 LS.7*** *Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).*
**3.MD.B.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

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## Learning Objectives

1. Explain how changes in an environment can impact the survival of animals.
2. Recognize that animals can have different responses to changes in an environment.
3. Recognize that animals have different needs that may or may not be met by a particular environment.
4. Create a bar graph to show fluctuations in habitat components and the population of a model animal (deer).

## Assessment

In their science journals, students should draw a picture of the deer and the four resources "played" in the game. Draw a second picture and choose to eliminate one of the four resources and describe how and why it impacts the deer population.

**WIDA Language Objectives**

**TBD**

## Targeted Academic Language/ Key Vocabulary

**Tier 1:** habitat, drought, community
**Tier 2:** survive,
**Tier 3:** reproduction, decomposition

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Space (playground, gym, etc.) | Classroom Teacher |
| 20 | Graph paper & pencils | Classroom Teacher |
| 1 | Data table handout (at the end of this lesson) | Binder, teacher to copy |

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| | | |
|---|---|---|
| 1 | Graphing worksheet (at the end of this lesson) | Binder, teacher to copy |
| **1** | **Bucket or bin to hold survival component "popsicle sticks"** | **Bin** |
| **25** | **Popsicle sticks, labeled for each of the 5 survival component (5 each)** | **Bin** |
| **1 roll** | **Masking tape to mark areas** | **Bin** |
| 1 | Large flip chart (with the same data table as handout) to record class data | Classroom Teacher |

****Items in bold should be returned for use next year****

# LESSON DETAILS

## Lesson Opening/Activator

1. Ask students what is a habitat? Ask if they think a river is a habitat? (It is.) **[SP1-Asking Questions/Defining Problems]**

2. Building on student ideas, explain or review/reinforce that a habitat is an area that includes food, water, shelter, and space for plants and animals. Ask students to share some examples of habitats they have learned about. Students can "pair and share" and describe the habitat in their backyard or their favorite park to their partner.

3. Ask what happens to plants or animals in the habitat when there is a change to the environment/habitat. Give some examples. Discuss how these changes impact the existence of the plants or animals. Introduce key vocabulary like **life cycle**, **decomposition**, and **reproduction** and explain to the students that they will be doing an activity that simulates these conditions.

4. Ask if changes in an environment only impact animals or might they affect plants, too. (Give the example of the American Chestnut Tree, 99.9 percent have died from an imported disease, ask students to hypothesize what happened to the birds that built nests in the trees and to the small animals that ate the nuts from the trees, etc.).

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## Oh Deer! The game

(Lesson likely done over two days – try to break between the activity and discussion/data analysis)

1. Tell students they will be participating in an activity that emphasizes the most essential things animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, air, and favorable temperature.
   - Explain they will be playing a simulation or game that represents what happens in nature. An animal needs all of the habitat components and is seeking these components to survive, if an animal isn't able to eat, drink, find shelter, and have space to grow and reproduce, it does not survive.
   - Explain they will play multiple rounds of this game and they will have an opportunity to play different parts during the game.
   - Explain they will need to take time between each round to count deer who survived and those that did not. They will write this data in their own data table and they will graph this data together during the next day.
   - Explain the rules of the game once before students move to the space.

     **Setting up the Play Area:** Using masking tape mark off 2 parallel lines at least 10 feet apart, and 2 holding areas, one for deer that "Survive and Reproduce" (i.e., **do** find their habitat component) and one for deer that "Die and Decompose" (i.e., **don't** find their habitat component). See diagram at end of unit.

2. Ask the students to count off in fives. (If the number of students in the class is too low for five habitat components, air and favorable temperature can be combined and labeled as "space." Explain to the students that having a suitable living space entails air and a favorable temperature that is conducive to surviving. Have all the 1's go to Line 1 and find a space on the line; all 2's, 3's, 4's, and 5's, go to Line 2 and find a space on that line. At the beginning of the game and the first round, the 2 lines of students should be facing each other. (See diagram in resources.)

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3. Tell the 1's they represent "deer." Explain all animals, including deer need a good habitat to survive. Again ask the students what the essential components of a habitat are (food, water, shelter, space). Explain that the deer (1's) need to find one of those 4 things to survive. (The deer will know what they need by randomly selecting a Popsicle stick out of the container with one of the 4 habitat components written on it. They will look for what they need based on how the students on Line 2 are holding their hands to represent each component.)

4. Tell the 2's, 3's, 4's, and 5's they are the habitat components of food, water, shelter, and space. The student will also randomly select a Popsicle stick out of the container with one of the 4 habitat components written on it. The students depict which component they selected by holding their hands in a specific way:
   a. To represent food, clamp hands over their stomach.
   b. To represent water, put hands over their mouth.
   c. To represent shelter, hold hands together over their head.
   d. To represent space, hold hands out from their sides

Have the entire class practice the hand motions that represent each habitat component by shouting out, "food," "water," "shelter" and "space" while modeling the hand placement.

5. Ask the students to count the number of deer on Line 1, record that number in the class data table. Ask the students to count the habitat components on Line 2, record that number in the class data table. Ask the students to predict if they think all of the deer will find the habitat component they need during the first round. Note the predictions on the class table.

6. The activity starts with all players lined up behind their respective lines (deer on one side, habitat components on the other side). Tell the students to all turnaround so the 2 lines of students have their backs to each other.

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7. Begin the first round by walking down the deer line and handing each deer a “deer” Popsicle stick. The “habitat components” also select a Popsicle stick out of the habitat container. It will have one of the 4 habitat components written on it

8. Give the students a few moments to put their hands in place—over stomachs, over mouths, over their heads, or straight out.

9. When the students are ready, say, “Oh Deer!” Each deer and each habitat component turn to face the other.

10. When deer see the habitat component they need, they should skip to it. Each deer must hold the Popsicle stick until “capturing” a student who represents that component. Each deer that acquires its necessary habitat component takes itself and the habitat component student to the “Survive and Reproduce” box, capturing a component represents the deer successfully meeting its needs and successfully reproducing as a result. Both the deer and the habitat component will be deer in the next round. Any deer that fails to find its food, water, shelter or space should move to the “Die and Decompose” box. Any deer that died will be a habitat component in the next round; they become the food, water, or shelter available to the deer that are still alive.

11. Ask the students to count how many deer were in the “Survived and Reproduced” box (e.g., they found their habitat component) after Round 1. Ask the students how many deer died and decomposed. Most deer should have survived and reproduced. There will be many habitat students who did not pair up with a deer. They go back to the habitat line. If any deer died, they now go to the habitat line and become a habitat component. The teacher records the number total survivors and total deer deaths at the end of each round in the class data table. Continue the activity for approximately 2-3 more rounds. At the end of each round, the “deer students” return their Popsicle sticks to the container and draw new sticks (to get new survival component) once they are on the line. At the start and end of each round, the teacher should take time to count the deer and habitat components, as well as the survivors and dead.

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The teacher should take time at the end of each round to talk about what happened.

- Why are there more deaths at the end of a round?
- Why are there more or fewer habitat components?

Students should start to realize the connection that the greater numbers of deer, the less habitat components for that deer due to competition, limited resources, and population growth.

12. After the students have played 3 rounds of "Oh Deer," in the 4th round, the teacher should secretly tell the habitat students that *there is a drought and so there is no water available for the deer.* They may only be food, shelter/space. Run the simulation. Count those who survived and reproduced and those who died. Record findings on the class data table. Discuss what happened and offer the reasons for it.

13. For Round 5, whisper to the habitat students that the drought continues and without water, food can't grow. Habitat students may only make the signs of shelter and space. Deer continue to randomly select the Popsicle sticks from the entire assortment. Note the results at the end of the round on the class data table, take time to discuss student thinking about what is happening as the habitat changes.

14. For Round 6, whisper to habitat students that humans have decided to develop the area (build houses or a new factory), so there is no longer space or shelter, tell them they may only make the signs of food and water. Deer continue to randomly select the cards from the entire assortment. Note the results at the end of the round on the class data table, take time to discuss what is happening as the habitat changes.

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15. Continue playing rounds of "Oh Deer" as time permits. Limit the habitat in a variety of ways so students understand there is a relationship between animals that are able to meet their needs and survival/reproduction.

16. At the end of the simulation, bring the students back to the classroom/gathering space to place the data from the class simulation into their own data table.

17. Encourage students to talk about what they experienced and saw in the simulation and use the data as evidence for their reasoning **[SP7 - Arguments from Evidence]**. For example, they saw a small herd of deer (7 students in a class size of 20) begin by finding more than enough of its habitat needs, however, because the population of deer expanded over 2-3 rounds of the activity, it exceeded the ability of the habitat to supply what was needed to survive and reproduce. There was not sufficient food, water, and shelter for all members of the herd, and at that point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. The deer population was above the *carrying capacity* of the environment.

18. Now you will create a graph with the data collected, brainstorm some suggestions for the title of the graph, and write them on the board. Students will copy the class graph onto their own graphing sheet. Discuss what makes a good title for a graph and what information (e.g., the cause-and-effect relationship being measured) it should convey to the reader. It might be easiest to create a graph as a class and then let the students draw the graph in their science journal.

19. When the students have completed their graphs, have them glue them into their science journal.

## Lesson Closing

- Why did some deer live and some deer die?
- What four necessary resources does a habitat provide and how do those help the animals survive?
- What happened to the resources as the deer population grew, or got smaller?

## Assessment

In their science journals, students should draw a picture of the deer and the four resources "played" in the game. Draw a second picture and choose to eliminate one of the four resources and describe how and why it impacts the deer population.

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# Lesson 2: Who are you? Your traits.

## BACKGROUND

### Overview of the Lesson

Traits are qualities, features or other things that distinguish one organism from another, traits can include things like hair color, petal color (for flowers), tooth shape, leaf shape, beak shape, bone size, or muscle structure. Traits are what link adaptation and heredity, the two major themes of this unit. Traits come in two varieties: acquired (learned or gained) and inherited (heredity). Inherited traits are passed down from one generation to the next and acquired traits are learned or obtained over an individual's life, but not passed onto the next generation. Students will learn that traits are the "features and qualities" that change to help plants and animals adapt. This lesson uses YouTube videos so make sure the videos are reviewed and understood ahead of time in preparing for this lesson.

As you teach the lesson, remember to keep the essential question in the forefront: *How do living things adapt to their environment, and how does this help them survive?*

### Focus Standard(s)

**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.

***[2006] 3-5 LS.5*** *Differentiate between observed characteristics of plants and animals that are fully inherited (e.g. color of flower, shape of leaves, color of eyes, number of appendages) and characteristics that are affected by climate or environment (e.g. browning of leaves due to too much sun, language spoken).*

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## Learning Objectives

1. Explain the difference between acquired and inherited traits.
2. Discuss whether specific traits of plants and animals are inherited or acquired (or both), through observations, outside knowledge, and group discussions.
3. Give examples to show that all living things have traits that are inherited and traits that are acquired.

## Assessment

Have students answer the following in their science journals

1. List three traits and say whether they are inherited or acquired
2. Give an example of a plant or animal that has both inherited and acquired traits
3. Explain the difference between inherited and acquired traits

## WIDA Language Objectives

FORTHCOMING

## Targeted Academic Language/ Key Vocabulary

**Tier 2:** traits
**Tier 3:** inherited traits, acquired (learned) traits, variable trait

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Projector or ability to play online videos | Classroom Teacher |
| 1 | A plant | Classroom Teacher |

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| | | |
|---|---|---|
| | Science journals | Classroom Teacher |
| 1 | Inherited Traits handout (picture) | Binder, teacher to copy |
| 6 copies (1 per station) | "Who Has" Tally worksheet | Binder, teacher to copy |
| 1 | Frequency Table Graphing worksheet | Binder, teacher to copy |

****Items in bold should be returned for use next year****

# LESSON DETAILS

## Lesson Opening/ Activator

Review the video ahead of time as these videos will serve as a pre-teaching: (http://youtu.be/4_Pje5RdT0A). Play the video and pause to discuss the heritable traits of plants and how they are bred for certain traits like color and leaf size. Make a note to emphasize that traits are essentially a manifestation of the adaptation the organism undergoes. We can see the way animals or plants adapt through the traits that are inherited or are acquired. Decide if you'd like to play the videos through to the end or continue to pause when appropriate for more discussion.

1. Brainstorm a list of inherited (e.g., traits you are born with) human traits including, eye color, hair color, freckles, dimples, curling the tongue, and earlobes. Broaden the discussion to include inherited traits of dogs or other pets.

2. Brainstorm a list of acquired (e.g., traits that are learned) human traits including, riding a skateboard, doing addition, speaking another language, and learning to read. Ask about the acquired traits of dogs (to shake hands, lay down, sit) or other pets?

3. Brainstorm a list of inherited traits of plants (e.g., bark of trees, color of petal for flowers, taste of fruit).

4. Brainstorm a list of acquired traits in plants (e.g., shape of a bush after it is trimmed).

## During the Lesson

1. Pass out the Inherited Traits Picture worksheet.

2. Discuss as a class and relate it to the examples students gave, you may need to discuss or demonstrate the meaning of the word "variable" (relate it to the differences observed in the human traits; e.g., color of hair, size of second toe).

3. Set up six stations around the classroom. Each station will focus on collecting data on one of the inherited traits listed on the worksheet. Divide the students up into six groups and assign each group to be in charge of a station, as they will be collecting the data from the stations and presenting their finding to the class.
    a. Set up the stations so that the "Who Has…" worksheet is visible and accessible for students to write on; and the particular trait the station is focusing on is visible and clear with a picture or drawing.
    b. Have each student go around the stations and fill out the worksheet with their name and whether or not they have the trait the station was assigned. (It is OK if they don't get to all the groups.)

4. Once the students have gone through the stations, have groups return to their assigned station and tally up their findings. Pass out graphing sheets and have each group discuss, review the tally, and graph their findings.

5. Have the group come up to the front of the classroom and have one representative (teacher assign or group decide who) present the findings reasoning from data to conclusion.

## Lesson Closing

Ask the class if there were any surprises or confusion when surveying classmates. Were there any cases where behavior is a result of both an inherited trait and an acquired? **[SP1-Asking Questions/Defining Problems]**
Discuss the following questions as a class:

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- What are some other inherited traits of people?
- What are some inherited traits of animals?
- What do inherited traits explain? Ask students to record conclusions in science journal. Students should use at least on piece of data from their worksheet findings as evidence to support their conclusions

## Assessment

Have students answer the following in their science journals

1. List three traits and say whether they are inherited or acquired
2. Give an example of a plant or animal that has both inherited and acquired traits
3. Explain the difference between inherited and acquired traits

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# Lesson 3: Adaptation—For the Birds

## BACKGROUND

### Overview of the Lesson

Animal adaptations are any body shape, process, or behavior that allows an organism to survive in its environment, populations of animals change over time in response to their environment. Birds have different kinds of beaks, depending on what they eat and where their food source is. For instance, birds may find their food in water, mud, flowers, seeds, or wood, the different shapes of beaks allow easier access to these various food supplies. If an environment was altered, organisms within the area might not survive. Adaptation to a particular environment occurs over time as organisms best suited to the environment survive, reproduce, and pass their inherited traits to the next generation. This hands-on lesson models bird beaks and the particular type of food the beak is adapted for. **[SP2-Modeling] This lesson has lots of materials and 6 stations, so it will take time to set up.** Each station will have a food source and a set of three different utensils, which students use as sample "beaks" in the experiments. (Note: Much of this concept is integral to the CEPA to be given at the end of the unit.)

The specific birds that eat each type of food should be discussed at the end of class.

1. Nectar (colored water) needs to be sucked out = Hummingbird
2. Worms (gummy worms) need to be dug and pulled out = Robin
3. Seeds (sunflower seeds) need to be cracked open = Sparrows, Finches
4. Fish (Styrofoam pieces) need to be scooped out of the water = Heron
5. Small insects (rice) need to be pried out of small crevices = Woodpeckers
6. Meat (marshmallows) will need to be pulled off of bones = Owls, Hawks

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## Focus Standard(s)

**3-LS4-2:** Use evidence to construct an explanation for how the variation in characteristics among individuals of the same species may provide advantages to these individual 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.

***(2006)3-5 LS.6*** *Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, e.g. shape of beak or feet, placement of eyes of head, length of neck, shape of teeth, color.*

## Learning Objectives

1. Explain how specific bird beaks are adapted to eat a certain type of food.
2. Predict what type of food different birds eat based on the shape of their beak.
3. Collect and record data to determine which type of beak is best suited for which type of food.
4. Hypothesize what would happen to a bird population if its environment changed.
5. Explain the results of the bird beak experiment to the class.

## Assessment

- Record of experiment
- Science journal entry: Identify a food source and draw a beak that would be best suited to eating that food source, giving evidence for why the beak would be good for eating that food source. Optional: write a description (as a "beak user's guide" or "how-to manual") for how the beak would eat the identified food source.

## WIDA Language Objectives

FORTHCOMING

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

## Targeted Academic Language/ Key Vocabulary

**Tier 1:** beak
**Tier 2:** model, environment (as in habitat)
**Tier 3:** naturalist, common descent, organism, adaptation

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Projector or ability to play online videos | Classroom Teacher |
| 1 | Bird Beak PowerPoint or PDF (pictures of bird beaks) | Color copy in binder, teacher to copy for students (if needed) |
| 1 | Bird Beak Master Sheet | Binder, teacher to copy |
| 1 | Student Worksheet | Binder, teacher to copy |
| <br>1<br>1<br>1<br>1<br>1 | *Station 1*<br>**Graduated cylinder (add water)**<br>**Cup**<br>**Shoestring**<br>**Dropper**<br>**Sponge strip** | All in Bin |
| <br>1 bag<br>1<br>1 bag<br>1 | *Station 2*<br>Gummy worms<br>**Cup**<br>Potting soil<br>**Deep pan** | All in Bin |

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| | | |
|---|---|---|
| 1<br>1<br>1 | **Straw**<br>**Chopsticks**<br>**Pliers** | |
| 1 bag<br>1<br>1<br>1<br>1 | *Station 3*<br>Sunflower seeds<br>**Cup**<br>**Pliers**<br>**Chopsticks**<br>**Tweezers** | All in Bin |
| 5<br>1<br>1<br>1<br>1<br>1 | *Station 4*<br>Styrofoam pieces<br>**Cup**<br>**Shallow pan (add water)**<br>**Chopsticks**<br>**Tweezers**<br>**Slotted spoon** | All in Bin |
| 1<br>1<br>1<br>1<br>1 | *Station 5*<br>Rice in circular piece of styrofoam<br>**Cup**<br>**Dropper**<br>**Tongs**<br>**Tweezers** | All in Bin |
| 1 | *Station 6*<br>Marshmallows tied to string | All in Bin |

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| | | |
|---|---|---|
| 1 | **Cup** | |
| 1 | **Chopsticks** | |
| 1 | **Tongs** | |
| 1 | **Skewers** | |

****Items in bold should be returned for use next year****

# LESSON DETAILS

## Setup

You will need to set up six stations in advance of teaching this lesson. See previous section for the materials for each station. *This lesson has lots of materials and six stations, so it will take some time to set up.*

## Lesson Opening/ Activator

1. First show students the Darwin evolution video: (https://www.youtube.com/watch?v=4ekGLlKd_HU) and discuss the adaptation of tortoises' that enable them to find food in their environment (lots of greenery vs. high cactus) as a bridge to understanding how bird beaks are adapted for the food their habitats offer. Discuss the following questions as a class. What does adaptation mean? What are some examples of adaptations? How might living things become adapted to their environment? (Remember, adaptations must be inherited.) Give examples of adaptations (inherited traits that change over time to enable organisms to survive, e.g., shape of beak or feet, color of petals on flowers, length of claws, size of paws (refer to badgers) placement of eyes on head, length of neck, shape of teeth, color of feathers).

2. Now, relate adaptations to birds, ask the students to share what they know about birds. What makes a bird a bird? What do birds need to survive? What kinds of food do they think birds eat? (Insects, seeds, berries, and meat are among the most common.) Where do birds live? What birds do they see and hear everyday? Play the following video, make sure to pause after each image: (http://youtu.be/quJBrYU7hnM). This can also be provided as PDF or in PowerPoint format.

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## During the Lesson

1. Arrange the following materials in front of the class.
   - A graduated cylinder filled with colored water (replace the colored water with clear water for the challenge station)
   - A pan of potting soil with gummy worms buried throughout
   - Sunflower seeds spread throughout a pan
   - A dish of shallow water with Styrofoam cubes floating in it
   - Rice grains tucked into Styrofoam
   - Marshmallows hanging on string

   Discuss with students that each of these items represents a type of food eaten by various birds. Ask students if they can hypothesize what a bird would have to do in order to reach the food supply. Does the shape of a bird's beak limit what they can eat?

2. Divide students into groups of at least three and assign each group to a station

3. Make sure the stations and equipment are set up around the room. (Each station should have a set of instructions, a recording sheet, a food source, a cup to place used food source, and a set of three different utensils, which they are to use as sample "beaks." Each station should take approximately 5-10 minutes for the students to try out the different utensils, it is encouraged that the stations be set up outlining a circle in order to make it easier for the student to transition from one station to the next.)

4. After reading their instructions, ask students to write their station number and predict which "beak" will work best for "eating" their specific "food" on their recording sheet.
5. Each group will see which food is easiest to gather with each utensil.

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## Station Configuration

### Station 1

Food source: Graduated cylinder with water

Sample beaks: shoestring, dropper, and sponge strip

Procedure:

1) Experiment with all three tools and decide which "beak" works best to take water from the graduated cylinder and put into a cup.
2) Have students record their answer and give evidence to support the conclusion.

### Station 2

Food source: Gummy worms burried in potting soil in a pan

Sample beaks: straw, chopsticks, and pliers

Procedure:

1) Experiment with all three tools and decide which "beak" works best to remove gummy worms from the potting soil. Students should place the worms into the cup provided
2) Have students record their answer and give evidence to support the conclusion.

### Station 3

Food source: Sunflower seeds spread out in a pan

Sample beaks: pliers, chopsticks, and tweezers

Procedure:

1) Experiment with all three tools and decide which "beak" works best to crack open the sunflower seeds and move to a cup.
2) Have students record their answer and give evidence to support the conclusion.

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**Station 4**

Food source: Floating styrofoam squares in a pan of shallow water

Sample beaks: chopsticks, tweezers, and slotted spoon

Procedure:

1) Experiment with all three tools and decide which "beak" works best to remove all of the styrofoam from the water.
2) Have students record their answer and give evidence to support the conclusion.

**Station 5**

Food source: Rice stuck into styrofoam

Sample beaks: dropper, plastic tongs, and tweezers

Procedure:

1) Experiment with all three tools and decide which "beak" works to remove rice from the styrofoam and place in a cup
2) Have students record their answer and give evidence to support the conclusion.

**Station 6**

Food source: Hanging marshmallows

Sample beaks: Chopsticks, tongs, and skewer

Procedure:

1) Experiment with all three tools and decide which "beak" works best to remove the marshmallows from the string.
2) Have students record their answer and give evidence to support the conclusion.

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## Lesson Closing

Discuss the following questions as a class or in groups **[SP7-Arguments from Evidence]**:

- Why were some tools (beaks) better at getting food than others?
- How did the tools resemble the different shapes of bird beaks?
- What did your results tell you about bird beaks?

## Assessment

- Record of experiment
- Science journal entry: Identify a food source and draw a beak that would be best suited to eating that food source, giving evidence for why the beak would be good for eating that food source. Optional: write a description (as a "beak user's guide" or "how-to manual") for how the beak would eat the identified food source.

## Optional Extension (Note: This video is also referenced in other lessons)

1. Additional Experiment: Have students take their tools to another station and compare which is better between stations.
2. View Raccoons Living for the City: http://www.pbs.org/wnet/nature/raccoon-nation-video-living-for-the-city/7540/

Discuss the difference between adaptation and response to a situation, this video gives a preview of what is to come in the unit.

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# Lesson 4: The Eyes Have It

## BACKGROUND

### Overview of the Lesson

This lesson is a hands-on experiment that follows the adaptation of a fictional species (the Eggles) through birth, maturity, reproduction, and death, using eyes as the trait that is influenced by the environment. The focus of this lesson is the idea that the "dominant gene" is what is seen as a result of adaptation **[SP2 - Modeling]**. The lesson should be split into three parts; while the lesson should span three days so the Eggles have time to mature; it is not necessary to spend the entire period each day on this lesson. (Feel free to start the next lesson and have two lessons occurring simultaneously.) Make sure to coordinate with your classroom teacher how much time you wish to take for this lesson. This lesson can either take an entire lesson day (in which case the Science Fellows will simulate the change for the Eggles to grow between generations), or it can be started and left for the classroom teacher to finish when the science fellows are not there.

### Focus Standard(s)

**3-LS1-1.** Use simple graphical representations to show that species 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.
**3-LS4-2:** Use evidence to construct an explanation for how the variation in characteristics among individuals of the same species may provide advantages to these individual in their survival and reproduction.

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## Learning Objectives

1. Explain that variations in characteristics among individuals of the same species may provide advantages in surviving.
2. Use evidence to support the explanation that the environment can influence traits.
3. Analyze and interpret data to provide evidence for conclusions.

## Assessment

On the third day have the students refer to their graphing sheet and write the story of the Eggles, explaining how the eyes had adapted to no light and that it required a generation for that adaptation to occur. Use evidence to support how the variation in the Eggles eyes provided advantages in surviving.

## WIDA Language Objectives

FORTHCOMING

**Targeted Academic Language/ Key Vocabulary**
**Tier 2:** generation
**Tier 3:** species, heredity, dominant gene, mutation

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Graphing Worksheet | Master in binder, teacher to make copies |
| **5** | **Identical clear plastic bins:**<br>**-1 bin labeled Gen 1**<br>**-2 bins labeled Gen 2** | **Bin** |

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| | | |
|---|---|---|
| | **-2 bins labeled Gen 3** | |
| **1** | **Generation 1 Bin: 25 eggs (several of each color: blue, green, yellow, and all small eyes)** | **Bin** |
| **1** | **Generation 2 Bin: 25 eggs (several of each color, but not exactly same number of each, and all small eyes)** | **Bin** |
| **1** | **For Generation 3 Bin: 25 eggs (several of each color: blue, green, yellow, same not exactly same number of each color, some eggs are large eyed.)** | **Bin** |
| **1** | **Purple egg with purple pipe cleaners (mutation)** | **Bin** |
| **1** | **Empty Generation 2 bin** | **Bin** |
| **1** | **Empty Generation 3 bin** | **Bin** |
| 2 bags | Confetti | Bin |

****Items in bold should be returned for use next year****

# LESSON DETAILS

## Lesson Opening/ Activator

Review what students learned about adaptation from the lesson on bird beaks. Have them pair and share with a partner something they remember about their experiment. Then tell students that something very exciting happened today: you just got a shipment of a new unstudied species! Pull out the Generation 1 bin and ask them to come up with a name for the new species. Sample ideas: Eggies, Eggles, or anything that a student makes up (avoid a name that is too similar to a student's name).

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# During the Lesson

## Suggested Lesson Schedule

### Day 1 in Eggles Lifespan

1. Start Generation 1 with three Eggles, one of each color. (Add plenty of seeds [pipe cleaner pieces] in them to then reproduce a larger number of Eggles in Generation 2).

2. Count together how many blue, green, and yellow eggs there are. Students record and graph their data on the first graphing page. (Use colored pencils if available.)

3. Then have students make observations together as a class and record them in their science journals:
   a. What happens when you shake the eggs?
   b. Do the eyes move?
   c. Are all the eyes the same size?

   *Make sure you mention that the eggs must be eating their food (confetti).*

4. Then tell the students that this generation's lives are almost over. But don't worry! As this generation dies, it releases its "seeds" (pipe cleaner pieces) to reproduce the next generation.

5. Open up the eggs and discover the "seeds" (pipe cleaner pieces) inside.

6. Discuss "What types of seeds come from blue eggs? From green eggs? From yellow?" Have the students record their observations.

7. Have each student deposit his or her "seeds" (pipe cleaners) into the empty Generation 2 bin. Let the bin sit in plain view, exposed to classroom light for the rest of the school day. Shake up the bin and tell the students that these "seeds" will combine (two together) to grow into new eggs. Add in some confetti for "food". For fun, you can always check the

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bin once in a while during the day to increase student engagement/excitement.

8. After students leave that day, replace the empty Generation 2 seed-filled bin with the egg-filled Generation 2 bin (to simulate the seeds growing into eggs). You can repurpose eggs from Generation 1 bin.

**Day 2 in Eggles Lifespan**

1. Do the same activities as Day 1. Have students count the number of eggs and graph the number of each color. In their observations, students can compare Day 2 graph to Day 1.

2. Collect the "seeds" from Generation 2 and place in the empty Generation 3 bin, but this time, place Generation 3 with the "seeds" in the dark, inside a closet or under a box that limits the light. Make sure the students are aware that this has occurred.

3. At the end of Day 2 after students leave, replace the Generation 3 seed bin with the egg-filled Generation 3 bin that has some large-eyed eggs.

**Day 3 in Eggles Lifespan**

1. The students follow the same procedure: count up the eggs in the egg-filled Generation 3 bin, graph, and compare to the previous graphs, record observations. This time make note that there is a new trait that isn't observed in the parents.

2. Discuss with students why some eggs might "grow" large eyes (to "adapt" to the low light/dark environment). Discuss why this adaptation might (or might not) increase survival (in the dark, large eyes make it easier to find “confetti” food). Discuss the concept of the “dominant gene” with this generation (the dominant gene in this case is the color blue, so make sure that each generation has a larger number of blue eggs). The large eyes are the adaptation mechanism and the color blue is the dominant gene emerging.

## Optional Extension

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An optional concept that can be discussed is mutation, the purple egg and the purple pipe cleaners can represent this. Discuss how genes are passed down by way of different combinations, and while the dominant gene is the gene that continues over generations and beats all the others (hence the word dominant), it can sometimes be the case, by random chance, that another gene gets added into the mix and can be seen in species.

## Assessment

On the third day have the students refer to their graphing sheet and write the story of the Eggles, explaining how the eyes had adapted to no light and that it required a generation for that adaptation to occur. Use evidence to support how the variation in the Eggles eyes provided advantages in surviving.

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# Lesson 5: From Land to Water

## BACKGROUND

### Overview of the Lesson

Students will watch an animation that simulates the evolution of a land-based creature to a whale as it is known today. Explain to students that adaptations can occur over millions of years and seemingly completely new animals are actually evolved from earlier animals. The video will enable students to "see" the process of evolution. **Prior to beginning the lesson, be sure to watch both videos (focusing on the *Evolution of Whales*) in order to be able to effectively narrate the clips and form questions for the students before beginning the lesson.**

### Focus Standard(s)

**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-LS4-4.** Analyze and interpret data about changes in the environment in an area and describe how the changes may affect the ability of organisms that live in that area to survive and reproduce.
***3-5 LS.6*** *Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, e.g. shape of beak or feet, placement of eyes of head, length of neck, shape of teeth, color.*

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## Learning Objectives

1. Describe the process of evolution by relating how adaptations made to limbs and organs over millions of years allowed whales to move from the land to water.

## Assessment

Have students respond to the following prompt in their science journals: It has taken millions of years for whales to evolve into the form they have today, explain how adaptations helped the whale move from land to water. Have students use the words forelimbs, hind legs, fluked tail, and nostrils in their response.

## WIDA Language Objectives

FORTHCOMING

## Targeted Academic Language/ Key Vocabulary

**Tier 1:** nostrils
**Tier 2:** hypothesize, evolution
**Tier 3:** fluked tail, adaptation, natural selection

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Projector or ability to play online videos | Teacher |
| 1 | Organ evolution worksheet:<br>Forelimbs, hind limbs, fluked tail, nostrils | Master in binder, teacher to make copies |

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# LESSON DETAILS

## Lesson Opening/ Activator

1. Review what students have learned about and have them pair and share with a partner something they remember..

2. Reintroduce the concept of evolution and ask students to hypothesize which animal a dog descended from (came from)? Watch the video clip on the evolution (domestication) of wolves into dogs: *(https://www.youtube.com/watch?v=2aSjUHRr-AE).* After viewing the video, break the students into groups and have them use their previous knowledge regarding dogs and evolution in order to create a Venn diagram in which they write in the traits of wolves and the traits of dogs, you can also do this as a class.

3. Discuss the timespan of the evolution of the dog (thousands of years) vs. the evolution of the whale (47 million) and why the students think that the evolution of dogs occurred over such a shorter timespan. The teacher will then ask the students how dogs are different, and relate it back to traits; discuss the traits of individual breeds (some were mentioned in the video).

## During the Lesson

1. Watch the Evolution of Whales video: (https://www.youtube.com/watch?v=eIc1WoEEVOY) as a class **(note: this video does NOT have sound).** The teacher or fellow will narrate the video in order to emphasize the key points to the class while guiding the students to form accurate impressions and ideas related to the evolution of the whale After this video is complete, the class will discuss what they saw and why they think the various body parts changed. This will allow the students to begin to understand the process of evolution.

2. Divide the students into four groups and explain that everyone is going to watch the video again, but this time each group will be the scientists responsible for recording the evolution of one part of the whale by drawing it or describing it via

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writing. Fore limbs (front paws), hind legs (back legs), fluked tail (flapper), and nostrils (nose). Ask students to pay attention to the time at which the part evolves.

3. Hand out worksheets to the respective groups and assign each group a body part.

4. Play the video again, narrating once again as appropriate, and pausing at all "evolutionary" periods, as indicated by date and name on the screen. At each pause, students draw or write about the newly evolved version of the creature as indicated by the change in the body part they are documenting. The group assigned the fore limbs notes the changes in the fore limbs on their worksheet; the other 3 groups do the same for their body part. Do the first evolutionary period together in order to insure comprehension. **[SP2-Modeling]**

5. At the end of the video, after the complete evolutionary adaptation has occurred, each group present its findings on the adaptation explaining how the limbs or organs they followed adapted to particular time and environment.

## Lesson Closing

Once again, break the students into four groups and provide the name of an animal (ape, lion, tiger, and wild boar) to each group and ask them to brainstorm what they believe the given animal evolved into. Working together, they will draw the provided animal and the animal that they believe descended from it (e.g., evolved from it) and prepare sentences explaining their opinions and ideas.

The groups will work with the Science Fellows, the teacher, and any other adults in the room in order to form their opinions and ideas based on prior knowledge and previous learning. The groups will then present their drawings and ideas to the rest of the class, using the previously constructed sentences to validate their claims.

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After each presentation, the class will discuss the ideas that were presented, and the teacher will guide the discussions in order to allow the students to see the connections between the provided animals and their correct descendants (man, domestic cat, and pig) respectively. An example of this could be if the students hypothesized that a goat is descended from a tiger, the teacher or science fellow would ask guiding questions such as, “What are similar traits of goats and tigers ?” or, “What is another animal that looks like a small tiger?” in order to allow students to create accurate assertions.
**[SP7 - Arguments from Evidence]**

## End of Lesson Assessment

Have students respond to the following prompt in their science journals: It has taken millions of years for whales to evolve into the form they have today, explain how adaptations helped the whale move from land to water. Have students use the words forelimbs, hind legs, fluked tail, and nostrils in their response.

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

# Lesson 6: The Great Kapok Tree

## BACKGROUND

### Overview of the Lesson

Students will consider the interdependent relationships among plants and animals in an environment and how changes can make it difficult for a given plant or animal to survive (for examples of potential student projects, see study guide at end of lesson.)

### Focus Standard(s)

**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-LS4-4.** Analyze and interpret data about changes in the environment in an area and describe how the changes may affect the ability of organisms that live in that area to survive and reproduce.
**W3.2.** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

### Learning Objectives

1. Give one example of how animals and plants depend on each other for survival.
2. List ways that changes in the environment impact the survival of the plants and animals that live there.
3. Explain some of the reasons that animals and plants survive well, less well or do not survive in an environment.

### Assessment(s) of Learning Objectives

Think about the animal you drew earlier in the lesson and answer the following questions in your science journal:

1. How does the animal depend on plants for survival?
2. What might happen to your animal if its habitat disappeared?
3. What would be required in the environment for your species of animal to survive?
4. What conditions in the environment might make it difficult for your species of animal to survive?

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## WIDA Language Objectives

FORTHCOMING

## Targeted Academic Language/ Key Vocabulary

**Tier 1:** señor, species
**Tier 2:** extinction
**Tier 3:** Amazon Rainforest, Kapok Tree

# Resources and Materials

| Quantity | Item | Source |
|---|---|---|
| 2 | ***The Great Kapok Tree* by Lynne Cherry** | Bin (teacher can make copies if needed) |
| 1 | *The Great Kapok Tree* Worksheets | 1 in binder, teacher to make copies for students |
| 1 | Activities Guide | Binder |

****Items in bold should be returned for use next year****

# LESSON DETAILS

## Lesson Opening/ Activation

1. Today students will learn about some ways or reasons why animals have difficulty surviving and why some struggle to survive and die off or even become extinct.
2. Show the video: http://mass.pbslearningmedia.org/resource/tdc02.sci.life.oate.rainforest/amazon-rainforest/

## During the Lesson

1. Introduce Lynne Cherry's T*he Great Kapok Tree*, and explain this story takes place in a Kapok Tree, which is in the Amazon

rainforest and is a habitat for many animals. You have the option to read the story to the students or play *Mrs. Thomas Reads The Great Kapok Tree*, a Reading Rainbow recording: http://youtu.be/OWpLkt_Lm9o. Before beginning the recording or reading, ask the students if any of them speak Spanish. After discerning whether or not any of the students speak that language, write the word "señor" on the whiteboard (if any of the students know what this word means, allow them to explain it to the class before proceeding). If not, explain that this word means "mister" in Spanish and that they will be hearing it in the story because the Kapok tree is found in the Amazon, where many people speak Spanish. Then ask the students to listen closely to what each animal says and how it feels because later they will each write about one of the animals.

2. Ask each student to choose an animal (it's okay if multiple students choose the same animal), now ask the students to draw a picture of their animal and then write a sentence explaining what is threatening their chosen animal's existence (habitat destruction, lack of food, etc.) in the story.

3. Model the worksheet (see appendix) as a group. For students who may have trouble picking an animal, give them two choices. Students aren't allowed to choose the worksheet "model" animal.

4. Hand out the worksheets and have students complete them and then paste in their science journal **[SP2-Modelling].**

## Lesson Closing

Put students into groups of 3-5 to share their pictures and read their responses, discuss their responses in light of essential question: How do living things (animals and plants) adapt to their environment so they are better able to survive? **[SP4 - Analyzing and Interpreting Data]**

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

## Assessment

Think about the animal you drew earlier in the lesson and answer the following questions in your science journal:

1. How does the animal depend on plants for survival?
2. What might happen to your animal if its habitat disappeared?
3. What would be required in the environment for your species of animal to survive?
4. What conditions in the environment might make it difficult for your species of animal to survive?

## Extension

View *Real Images Great Kapok Tree* (http://youtu.be/qoV03D914HQ), a video collage of photographic images taken from where the Great Kapok Tree grows in the Amazon. Discuss the difference between photographic images and illustrations.

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# Lesson 7: Environmental Change

## BACKGROUND

### Overview of the Lesson

Students will explore different changes to an environment and the impact of this change on populations of organisms. They will learn the three factors that impact environmental change, which are: change in climate, change in resource availability (including water, food, and shelter), and change in the shape of the land. They will also analyze and discuss the role of human actions such as industrial uses, agriculture, and livestock. They will also learn about the impact of rapid deforestation.

### Focus Standard(s)

**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-LS4-4.** Analyze and interpret data about changes in the environment in an area and describe how the changes may affect the ability of organisms that live in that area to survive and reproduce.
***3-5-ESS3.C*** *Societal activities have had major effects on land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments*
**W3.2.** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
**G3-5: 2.7** Explain that some Web sites and search engines may include sponsored commercial links.

### Learning Objectives

1. Explain how changes in an environment can impact the survival of different kinds of plants and animals.
2. Recognize that human activity can lead to environmental changes.
3. Employ information from online sources (videos) in order to create and justify ideas regarding deforestation.

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## Assessment

In their science journals, students respond to the following prompts:

1. List two main causes of deforestation of the Amazon Rainforest
2. Describe how plants' and animals' survival is affected.
3. Evaluate, citing evidence, whether the causes of deforestation are found locally.

### WIDA Language Objectives

FORTHCOMING

### Targeted Academic Language/ Key Vocabulary

**Tier 1:** habitat, rainforest
**Tier 2:** extinction
**Tier 3:** Amazon, deforestation

# RESOURCES AND MATERIALS

| Quantity | Item | Source |
|---|---|---|
| 1 | Video access and projection equipment | Classroom Teacher |

# LESSON DETAILS

## Lesson Opening/ Activator

Review what students learned the Great Kapok Tree and from the video of the Amazon Rainforest, then break the students up into five groups and have them brainstorm what they think the biggest threats to the plants and animal in both the forest and the rainforest are. They will collaboratively create a list and then share these lists with the entire class. The teacher can record the information on the whiteboard and guide the discussion in an effective manner, allowing the students to see how their ideas are similar and different than those of their peers. Tell them they are going to see another video about the Amazon

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Rainforest. Navigate to the video using Google in order to exemplify proper Internet search etiquette, reinforcing the idea that Google includes commercial links (ask the students which link they think should be clicked on before proceeding, guiding them to the correct link) Play the video https://www.youtube.com/watch?v=l1vcNO0jyxU&list=PLsAWD8mKKE97DrZE0gewaiwtssuby2jHY&index=2.

Explain to the students it is the same technique used to show change in the whale animation, but this time lapse, rather than taking 47 million years, takes place in 35 years. Using the stop button on the computer, pause the video to point out the changes. Ask students to discuss whether they think animals can adapt in such short a time. Remind them of the game "Oh Deer" they played in Lesson 1. At the end of the video, discuss the possible consequences of deforestation with the students, and ask them whether or not they think that deforestation is a threat to the plants or animals in the forest and rainforest. **[SP1 – Asking Questions/Defining Problems]**

## During the Lesson

Place students into 5 groups. Explain that the students are going to watch another video about deforestation (review what deforestation is) and ask what the students think will happen to the habitat and the plants and animals living in the rainforest. The groups will then, either through illustrations or text, describe what they believe will happen to the plants and animals in the rainforest. Explain these are not simple situations, but very complex. If students are having trouble understanding the term deforestation and the possible consequences of deforestation, the teacher could ask them to predict what would happen if it were not just one tree that was being cut down but all the trees. Once again, navigate to the video using Google, choosing the correct link based on student input, allowing them to begin differentiating between commercial and academic links. Before playing the video, remind the students to take notes about what they believe to be important information. Play the video: https://www.youtube.com/watch?v=YCJL8e6_YqA&index=5&list=PLsAWD8mKKE97DrZE0gewaiwtssuby2jHY. The teacher and science fellows can review the predictions made by the students, relating them to the information presented in the video as necessary through a class wide discussion.

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Talk about the essential question: How do people impact the habitat of animals and plants in an environment? Review the concept of "deforestation" referencing the video, and ask students to break into their previous groups (if they are not still in them), and, working together, list the three reasons for deforestation (as introduced in the CNN video). The students will also be asked to, as a group, provide their interpretations of why these reasons lead to deforestation. The groups will then present their lists and validation to the class. After each presentation, other classmates can ask questions and give compliments to the presenting group, allowing them to practice appropriate classroom etiquette while reinforcing the impact that humanity has on the forest and rainforest. **[SP8 - Obtaining, Evaluating and Communicating Information]**

## Extension

View Raccoons Living for the City:
http://www.pbs.org/wnet/nature/raccoon-nation-video-living-for-the-city/7540/

Be sure to point out that not all changes to an environment cause extinction, sometimes an organism moves or finds a way to adapt to the change, and sometimes a change to an environment can allow some organisms to thrive while others die out.

## Assessment

In their science journals, students respond to the following prompts:

1. List two main causes of deforestation of the Amazon Rainforest
2. Describe how plants' and animals' survival is affected. Evaluate, citing evidence, whether the causes of deforestation are found locally.

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# Curriculum Embedded Performance Assessment (CEPA)

**Students will:**

1. Create a bird based on beak and feet adaptations
2. Describe (drawn and written) the bird and its adaptations
3. Describe how adaptations can help survive in their habitat

## Explanation of procedure

1. Teacher should decide if the CEPA activity should include feet as well as beaks. If so, ask students to study bird's feet with the same scientific eyes they used to examine bird beaks. Using the bird beak and feet cards, discuss which beaks and feet are adapted for which environment(s).
2. The teacher should decide if students can work as individuals or in pairs.
3. Tell students that they will and design a mythical bird species. They will create the birds by choosing a beak and feet for their bird. Students need to describe an environment in which the bird can survive and reproduce.

## Procedure

1. Review and revisit lessons 1 and lesson 3.
2. Review examples of animals and their adaptations discussed throughout the unit.
3. Give each student or pair of students a set of bird feet cards and bird beak cards from *Design a Bird* packet.
4. Students will choose one card from each category: one bird beak type and one bird feet type.
5. Tell the students they will design a bird, students must:
   i) Draw a picture of their bird referencing the adaptation cards they chose.
   ii) Give their bird a name.
   iii) Draw its habitat.
   iv) Write paragraph about the habitat. (Their habitat must match at least one of their adaptations, and some birds may be able to survive in more than one habitat depending on what beak/feet they have chosen).

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# Unit Resources: Videos

This following video is not included in any of the lessons but it does provide general information about adaptation, heredity, evolution, and natural selection *Definition Evolution (https://www.youtube.com/watch?v=hnOfqaEruYE)*

***Lesson 2***
*Traits Plant Variety:*
(http://youtu.be/4_Pje5RdT0A)

Extension: *Raccoons Living for the City*
http://www.pbs.org/wnet/nature/raccoon-nation-video-living-for-the-city/7540/

**Lesson 3**
*Bird Beak Adaptations (static video):*
http://youtu.be/quJBrYU7hnM

Extension: *Raccoons Living for the City*
http://www.pbs.org/wnet/nature/raccoon-nation-video-living-for-the-city/7540/

**Lesson 5**
*Wolves2Dogs:*
*(https://www.youtube.com/watch?v=2aSjUHRr-AEs*

*Evolution of Whales:*
https://www.youtube.com/watch?v=eIc1WoEEVOY&index=1&list=PLsAWD8mKKE97DrZE0gewaiwtssuby2jHY

**Lesson 6**

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

*Amazon Rainforest:*
http://mass.pbslearningmedia.org/resource/tdc02.sci.life.oate.rainforest/amazon-rainforest/

*MrsThomasReadsTheGreatKapokTree (*Reading Rainbow style video*)*
http://youtu.be/OWpLkt_Lm9o

Extension: *Real Images Great Kapok Tree*
(http://youtu.be/qoV03D914HQ) images

**Lesson 7**
*CNN_Deforestation:*
https://www.youtube.com/watch?v=YCJL8e6_YqA&index=5&list=PLsAWD8mKKE97DrZE0gewaiwtssuby2jHY

*Time Lapse Deforestation:*
https://www.youtube.com/watch?v=l1vcNO0jyxU&list=PLsAWD8mKKE97DrZE0gewaiwtssuby2jHY&index=2

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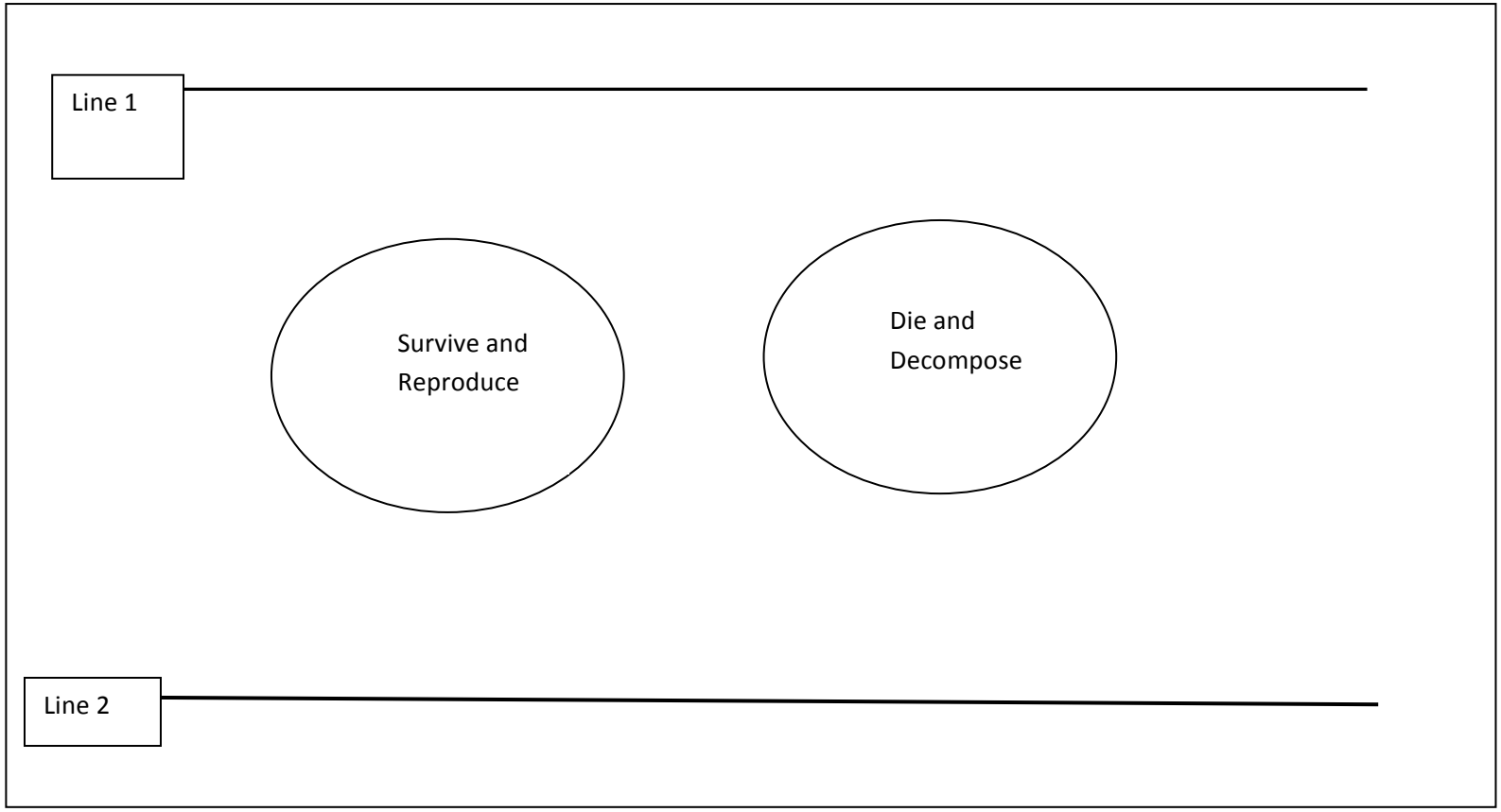
# Lesson 1: Oh Deer! Worksheet

**Lay Out of Space/Room**




This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

| Round 1 Before | | Round 1 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

| Round 2 Before | | Round 2 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

| Round 3 Before | | Round 3 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

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| Round 4 Before | | Round 4 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

Special condition? _____

| Round 5 Before | | Round 5 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

Special Condition? _____

| Round 6 Before | | Round 6 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

Special Condition? _____

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| Round 7 Before | | Round 7 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

Special Condition? _____

| Round 8 Before | | Round 8 After | |
|---|---|---|---|
| Number of Deer | Number of habitat components | Number of Survivors | Number of deceased |
| | | | |

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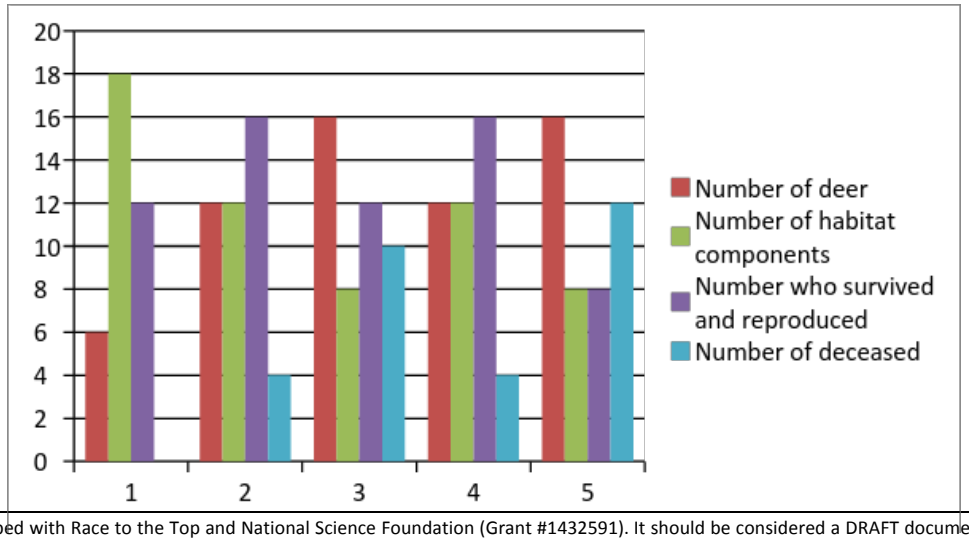
# Lesson 1: Oh Deer! Worksheets!

**Sample graphing categories and data (See next page for blank worksheets)**

| Round | Number of deer | Number of habitat components | Number who survived and reproduced | Number of deceased | Notes |
|---|---|---|---|---|---|
| 1 | 6 | 18 | 12 | 0 | |
| 2 | 12 | 12 | 16 | 4 | |
| 3 | 16 | 8 | 12 | 10 | |
| 4 | 12 | 12 | 16 | 4 | drought |
| 5 | 16 | 8 | 8 | 12 | drought and no food |
| 6 | | | | | |

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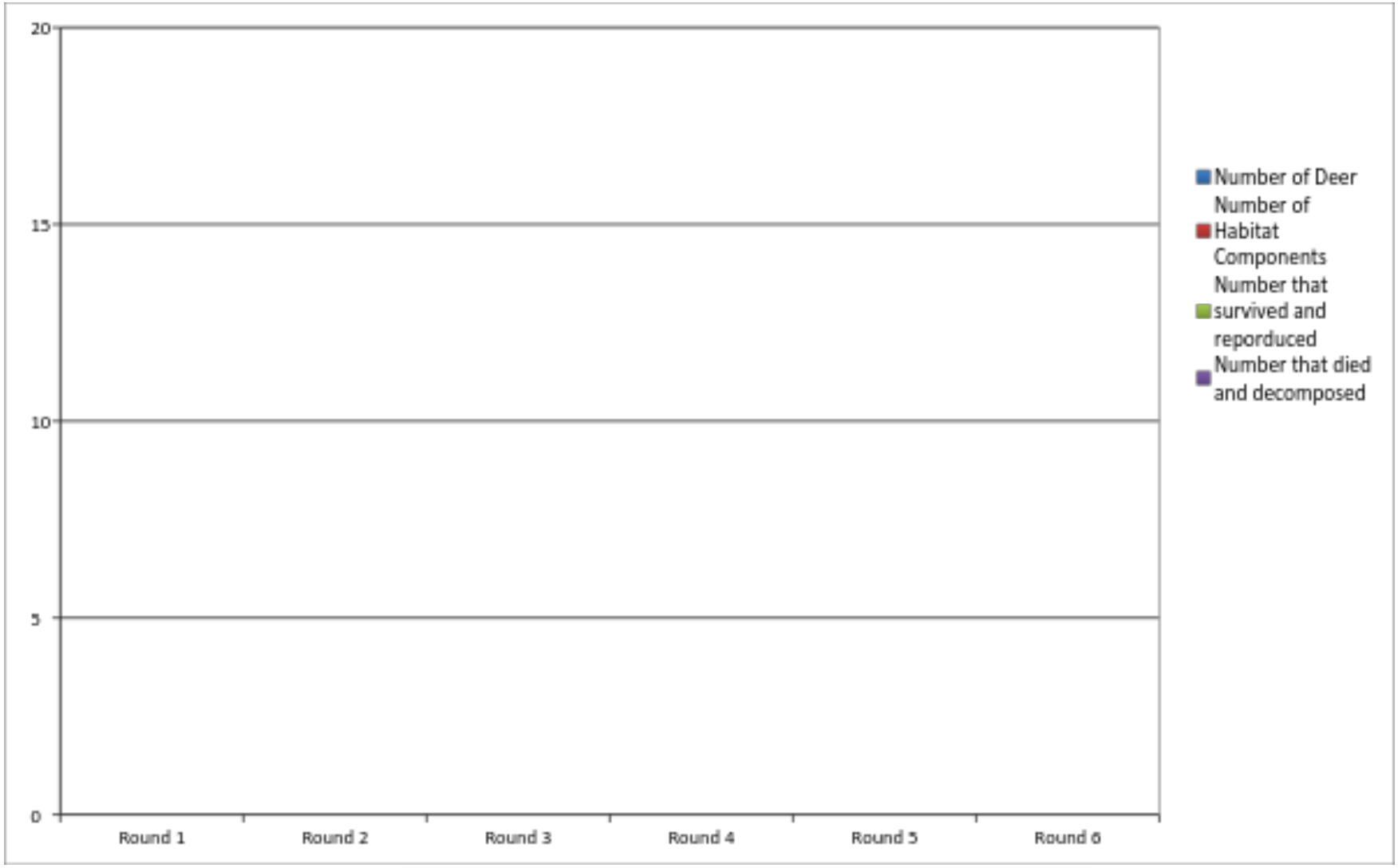
# Lesson 1: Oh Deer! Worksheet

**Graph for Categories and Data**

| Round | Number of deer | Number of habitat components | Number who survived and reproduced | Number of deceased | Notes |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | Drought |
| 5 | | | | | Drought and no food |
| 6 | | | | | |
| 7 | | | | | |

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

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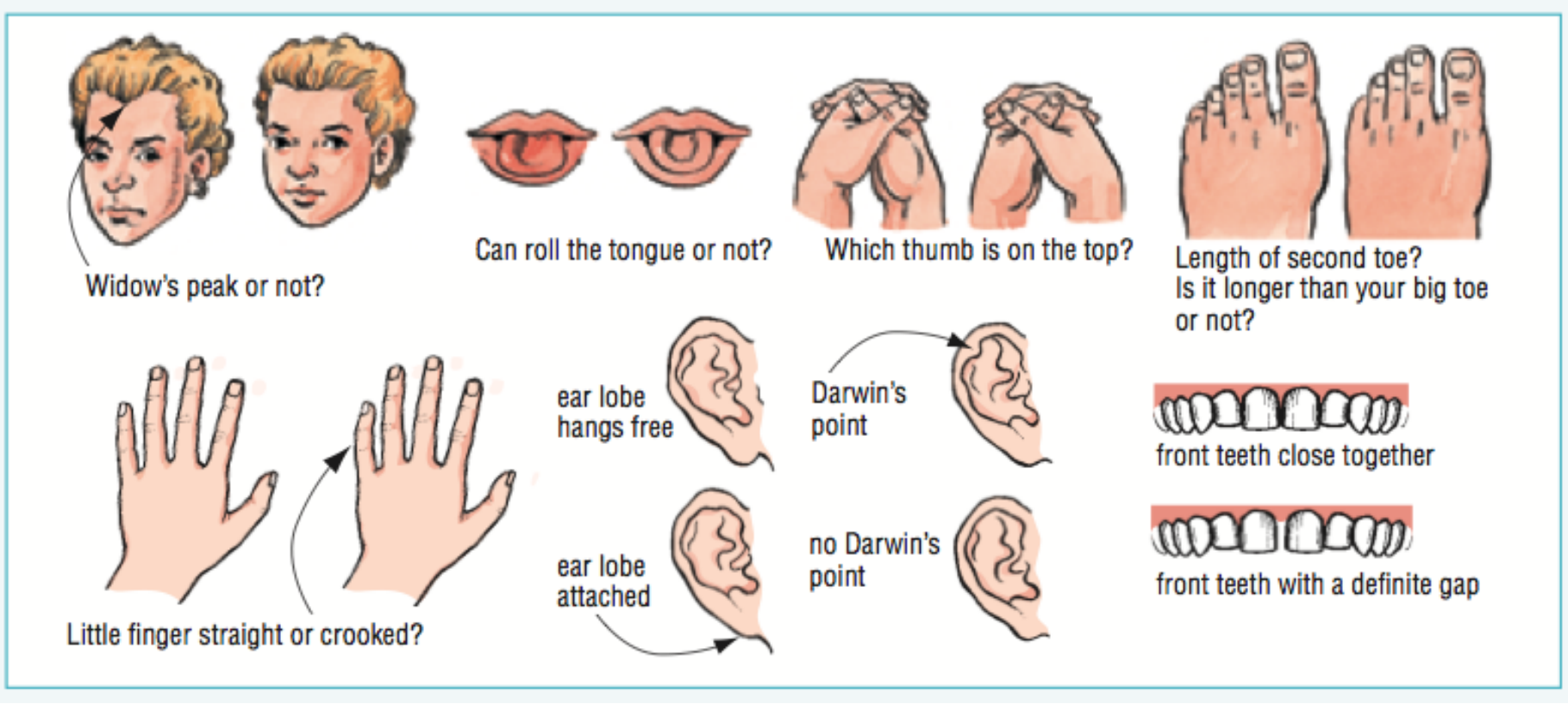
# Lesson 2: Inherited Traits Picture Worksheet, Trait Image Option

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# EXAMPLES OF INHERITED TRAITS

**Some people have a genetic trait that creates indentations on their cheeks called dimples**

Dimples

**These two images show the difference between a regular thumb and a "Hitchhiker's thumb" which, because of a genetic difference, can bend farther backwards.**

Hitchhiker's Thumb

Regular Thumb

**Tongue rolling is a genetic trait certain people have that allows them to curl their tongue.**

Curled Tongue

Photo Credits: "The Amazing Picture Machine"
http://www.ncrtec.org/picture.htm
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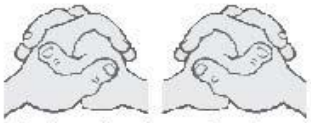
Funded by NSF DUE-IUSE Award #1432591

Some people have toes that decrease (get smaller) in size from the big toe to the small one while other people have a second toe that is longer than their big toe.

Short Second Toe

Long Second Toe

Are you right or left thumbed? Put your hands together, interlocking your fingers. Which thumb is on top?



Left Thumbed Right Thumbed

Attached Earlobe

Unattached Earlobe

Are your earlobes attached or unattached? A person with attached ear lobes will have the lowest point of the ear lobe attached to the face. A person with unattached ear lobes will not have the lowest point of the ear lobe attached to the face.

Can you make a Vulcan hand sign like Mr. Spock does on "Star Trek"? Try to spread your fingers into a "v". Some people can do this easily and some people can't!

Vulcan

Earthling

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http://www.ncrtec.org/picture.htm
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Name: _____

# "Who Has...."

| | |
|---|---|
| | |
| Write trait name here and draw that trait in the box | Write trait name here and draw that trait in the box |

| HAS | DOESN'T | Names of Classmates | HAS | DOESN'T |
|---|---|---|---|---|
| | | | | |
| | | | | |
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Name:_____

# Frequency Table: Who Has What

**Directions:** Fill in the lines below with the observable traits that you surveyed. Graph the results (totals from "Who Has…" worksheet) you gathered about your classmates.

| | | | | |
|---|---|---|---|---|
| 20 | 20 | | 20 | 20 |
| 19 | 19 | | 19 | 19 |
| 18 | 18 | | 18 | 18 |
| 17 | 17 | | 17 | 17 |
| 16 | 16 | | 16 | 16 |
| 15 | 15 | | 15 | 15 |
| 14 | 14 | | 14 | 14 |
| 13 | 13 | | 13 | 13 |
| 12 | 12 | | 12 | 12 |
| 11 | 11 | | 11 | 11 |
| 10 | 10 | | 10 | 10 |
| 9 | 9 | | 9 | 9 |
| 8 | 8 | | 8 | 8 |
| 7 | 7 | | 7 | 7 |
| 6 | 6 | | 6 | 6 |
| 5 | 5 | | 5 | 5 |
| 4 | 4 | | 4 | 4 |
| 3 | 3 | | 3 | 3 |
| 2 | 2 | | 2 | 2 |
| 1 | 1 | | 1 | 1 |
| | | | | |
| **Has** _____ write first observable trait above | **Does Not Have** _____ write first observable trait above | | **Has** _____ write second observable trait above | **Does Not Have** _____ write second observable trait above |
| **First Observable Trait** | | | **Second Observable Trait** | |



This unit was devel

# Lesson 3: Bird Beak Adaptations Worksheet

Names of Group Members:

Station #_____

**Circle your bird's food source**

1. Rice in styrofoam
2. Water in a thin cylinder
3. Sunflower seeds in a pan
4. Floating styrofoam
5. Soil with gummy worms
6. Marshmallows hanging from a string

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**List your tools**

**1.**

**2.**

**3.**

**Which type of beak (tool) worked best? Why?**

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**Which type of beak didn't work well at all? Why?**

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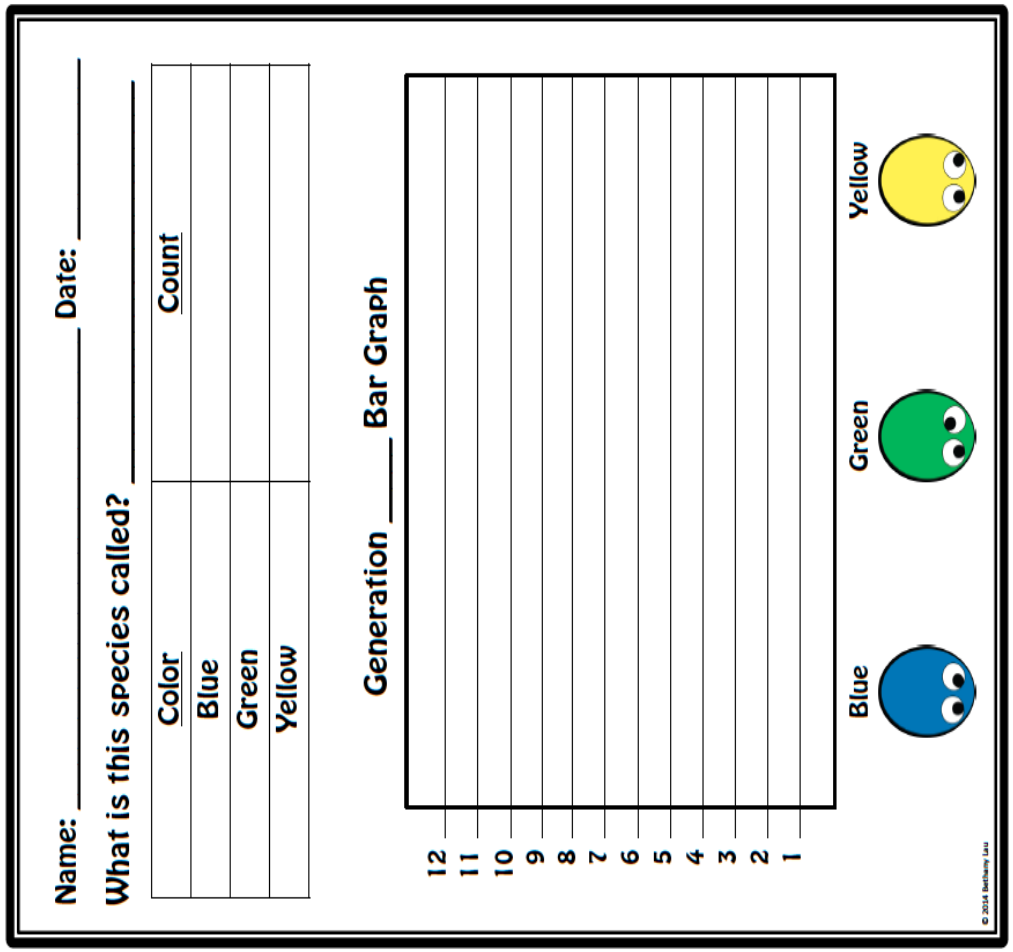
## Lesson 4: The Eyes Have It Worksheet



Name: _____ Date: _____

What is this species called? _____

| Color | Count |
|---|---|
| Blue | |
| Green | |
| Yellow | |

Generation ____ Bar Graph



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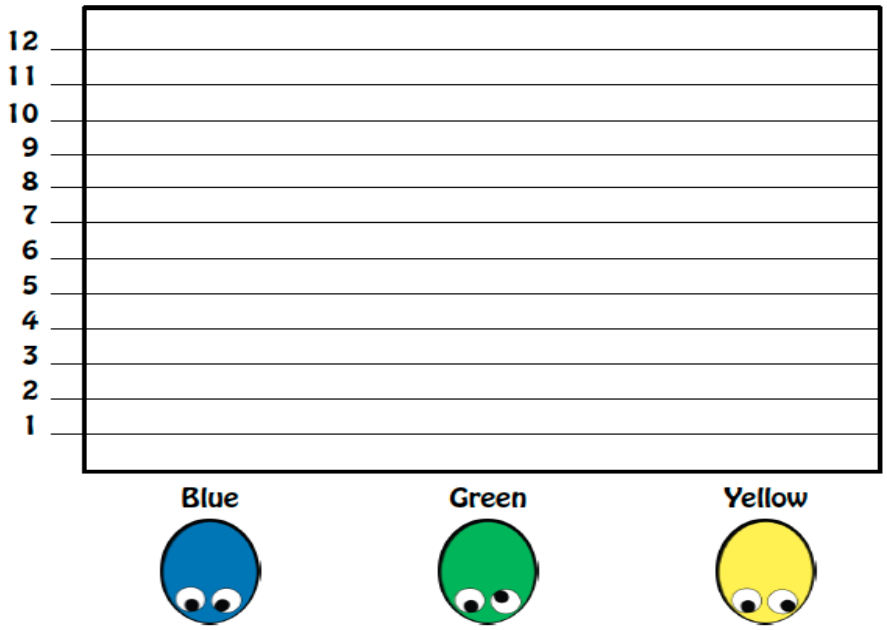
Name: _____ Date: _____

What is this species called? _____

| Color | Count |
|---|---|
| Blue | |
| Green | |
| Yellow | |

Generation _____ Bar Graph

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**Lesson 5:** Recording the Evolution of the Whale

Name _____

Trait_____

Pakicetus (what changed?)

How many years ago did they live?

Ambulocetus (what changed?)

How many years ago did they live?

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Recording the Evolution of the Whale: Page 2

Name _____

Trait_____

Maiacetus (what changed?)

How many years ago did they live?

Dorudon (what changed?)

How many years ago did they live?

This unit was developed with Race to the Top and National Science Foundation (Grant #1432591). It should be considered a DRAFT document that will be revised annually as the unit is piloted through the 2017-18 school year.

Recording the Evolution of the Whale: Page 3

Name_____

Trait_____

Llanocetus (what changed?)

How many years ago did they live?

What other traits evolved to create the modern whale?

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# Lesson 6: Great Kapok Tree Worksheets

Name: _____ Date: _____

Chosen animal: _____

Why might this animal have difficulty surviving in The Great Kapok Tree?

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Draw a picture showing what the Kapok Tree habitat could look like, include at least 5 animals and plants that live there. Make sure you draw your chosen animal! Don't forget to draw the predators and prey of your chosen animal too!

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Draw a picture showing what you think will happen to the plants and animals in your last drawing if your animal becomes extinct.  Use information from the story!

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Write at least 3 sentences explaining the differences between your two drawings

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# List of Unit Resources

## Lesson 1

| Quantity | Item | Source |
|---|---|---|
| 1 | Space (playground, gym, etc.) | Classroom Teacher |
| 20 | Graph paper & pencils | Classroom Teacher |
| 1 | Data table handout (at the end of this lesson) | Binder, teacher to copy |
| 1 | Graphing worksheet (at the end of this lesson) | Binder, teacher to copy |
| **1** | **Bucket or bin to hold survival component "popsicle sticks"** | **Bin** |
| **25** | **Popsicle sticks, labeled for each of the 5 survival component (5 each)** | **Bin** |
| **1 roll** | **Masking tape to mark areas** | **Bin** |
| 1 | Large flip chart (with the same data table as handout) to record class data | Classroom Teacher |

## Lesson 2

| Quantity | Item | Source |
|---|---|---|
| 1 | Projector or ability to play online videos | Classroom Teacher |
| 1 | A plant | Classroom Teacher |
| | Science journals | Classroom Teacher |
| 1 | Inherited Traits handout (picture) | Binder, teacher to copy |
| 6 copies (1 per station) | "Who Has" Tally worksheet | Binder, teacher to copy |
| 1 | Frequency Table Graphing worksheet | Binder, teacher to copy |

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## Lesson 3

| Quantity | Item | Source |
|---|---|---|
| 1 | Projector or ability to play online videos | Classroom Teacher |
| 1 | Bird Beak PowerPoint or PDF (pictures of bird beaks) | Color copy in binder, teacher to copy for students (if needed) |
| 1 | Bird Beak Master Sheet | Binder, teacher to copy |
| 1 | Student Worksheet | Binder, teacher to copy |
| <br>1<br>1<br>1<br>1<br>1 | *Station 1*<br>**Graduated cylinder (add water)**<br>**Cup**<br>**Shoestring**<br>**Dropper**<br>**Sponge strip** | All in Bin |
| <br>1 bag<br>1<br>1 bag<br>1<br>1<br>1<br>1 | *Station 2*<br>Gummy worms<br>**Cup**<br>Potting soil<br>**Deep pan**<br>**Straw**<br>**Chopsticks**<br>**Pliers** | All in Bin |
| <br>1 bag<br>1<br>1<br>1<br>1 | *Station 3*<br>Sunflower seeds<br>**Cup**<br>**Pliers**<br>**Chopsticks**<br>**Tweezers** | All in Bin |

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| | | |
|---|---|---|
| 5<br>1<br>1<br>1<br>1<br>1 | *Station 4*<br>Styrofoam pieces<br>**Cup**<br>**Shallow pan (add water)**<br>**Chopsticks**<br>**Tweezers**<br>**Slotted spoon** | All in Bin |
| 1<br>1<br>1<br>1<br>1 | *Station 5*<br>Rice in circular piece of styrofoam<br>**Cup**<br>**Dropper**<br>**Tongs**<br>**Tweezers** | All in Bin |
| 1<br>1<br>1<br>1<br>1 | *Station 6*<br>Marshmallows tied to string<br>**Cup**<br>**Chopsticks**<br>**Tongs**<br>**Skewers** | All in Bin |

## Lesson 4

| Quantity | Item | Source |
|---|---|---|
| 1 | Graphing Worksheet | Master in binder,<br>teacher to make copies |
| **5** | **Identical clear plastic bins:**<br>**-1 bin labeled Gen 1** | **Bin** |

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| | | |
|---|---|---|
| | **-2 bins labeled Gen 2**<br>**-2 bins labeled Gen 3** | |
| **1** | **Generation 1 Bin: 25 eggs (several of each color: blue, green, yellow, and all small eyes)** | **Bin** |
| **1** | **Generation 2 Bin: 25 eggs (several of each color, but not exactly same number of each, and all small eyes)** | **Bin** |
| **1** | **For Generation 3 Bin: 25 eggs (several of each color: blue, green, yellow, same not exactly same number of each color, some eggs are large eyed.** | **Bin** |
| **1** | **Purple egg with purple pipe cleaners (mutation)** | **Bin** |
| **1** | **Empty Generation 2 bin** | **Bin** |
| **1** | **Empty Generation 3 bin** | **Bin** |
| 2 bags | Confetti | Bin |

## Lesson 5

| **Quantity** | **Item** | **Source** |
|---|---|---|
| 1 | Projector or ability to play online videos | Teacher |
| 1 | Organ evolution worksheet:<br>Forelimbs, hind limbs, fluked tail, nostrils | Master in binder, teacher to make copies |

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## Lesson 6

| Quantity | Item | Source |
|---|---|---|
| 2 | ***The Great Kapok Tree* by Lynne Cherry** | Bin (teacher can make copies if needed) |
| 1 | *The Great Kapok Tree* Worksheets | 1 in binder, teacher to make copies for students |
| 1 | Activities Guide | Binder |

## Lesson 7

| Quantity | Item | Source |
|---|---|---|
| 1 | Video access and projection equipment | Classroom Teacher |

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