GR. 1 STEM UNIT

How Plants and Animals Survive

In this unit, students will learn about structures of plants and animals and how they contribute to the organisms’ survival. They will observe, discuss, draw, read, and write about plants and animals that are introduced through the unit and will engage in inquiry and engineering design experiences related to animal structures and survival.
UNIT DESCRIPTION:
In this unit, students will learn about structures of plants and animals and how they contribute to the organisms’ survival. They will observe, discuss, draw, read, and write about plants and animals that are introduced through the unit, and will engage in inquiry and engineering design experiences related to animal structures and survival.

Big Ideas (Student Insights that Will Be Developed Over the Course of the Unit):
- An environment includes both living and non-living things.
- Organisms have characteristics including structures and behaviors called “adaptations” that help them survive in their environments.

Essential Questions (Questions that Will Prompt Students to Connect to the Big Ideas):
- What is an environment?
- How are living things alike? How are they different?
- How do characteristics of living things enable them to survive in different environments?

BENCHMARKS/STANDARDS/LEARNING GOALS

<table>
<thead>
<tr>
<th>Science (HCPS III)</th>
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<tr>
<th>Technology (HCPS III)</th>
<th>CTE Standard 1: TECHNOLOGICAL DESIGN: Design, modify, and apply technology to effectively and efficiently solve problems</th>
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<td><strong>Engineering (HCPS III)</strong></td>
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</table>
| **Mathematics (CCSS)**     | • **CCSS.Math.Content.1.OA.C.6**: Add and subtract within 20, demonstrating fluency for addition and subtraction within 10.  
• **CCSS.Math.Content.1.NBT.A.1**: Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.  
• **CCSS.Math.Content.1.MD.C.4**: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. |
| **English Language Arts and Literacy (CCSS)** | • **CCSS.ELA-Literacy.RI.1.1**: Ask and answer questions about key details in a text.  
• **CCSS.ELA-Literacy.RI.1.7**: Use the illustrations and details in a text to describe its key ideas.  
• **CCSS.ELA-Literacy.RI.1.10**: With prompting and support, read informational texts appropriately complex for grade 1.  
• **CCSS.ELA-Literacy.W.1.1**: Write an opinion piece in which they introduce the topic or the name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure. W.K.2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.  
• **CCSS.ELA-Literacy.W.1.2**: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.  
• **CCSS.ELA-Literacy.W.1.8**: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.  
• **CCSS.ELA-Literacy.SL.1.1**: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.  
a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).  
b. Build on others’ talk in conversations by responding to the comments of others through multiple exchanges.  
c. Ask questions to clear up any confusion about the topics and texts under discussion.  
• **CCSS.ELA-Literacy.SL.1.4**: Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.  
• **CCSS.ELA-Literacy.SL.1.5**: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.  
• **CCSS.ELA-Literacy.SL.1.6**: Produce complete sentences when appropriate to task and situation. |
| STEM Competencies | **Indicator 2.6**: Reasonably implements a solution  
• fulfills one’s responsibility in contributing, explaining, justifying, or implementing a solution to a design, inquiry, or problem-solving challenge.  
**Indicator 3.3**: Generates new and creative ideas and approaches to developing solutions  
• raises questions about the world and seeks information through careful observations, investigations, and experiments.  
• uses creativity to generate new and innovative solutions.  
**Indicator 4.1**: Recognizes and understands what quality performances and products are  
• gathers relevant information from multiple sources and media, and draws evidence from information.  
**Indicator 5.1**: Effective Communicator  
• uses drawings, models, tables, graphs, symbols, and/or language (both oral and written) to gather and organize their information and support their ideas. |
<table>
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<tr>
<th>Lesson Title/Description</th>
<th>Learning Goals (What Students Will Know and Be Able to Do)</th>
<th>Assessments</th>
<th>Time Frame</th>
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</table>
| **1** What is an Environment? | Students can distinguish living and non-living things in an environment. They can collect, organize, count, and describe data based on observations. | -Teacher Observation  
-Student Data  
-Journal Entry | 1 class period (50 min.) |
| **2** Animal Adaptations (multiple lessons) | Students build background knowledge and vocabulary over multiple sessions in which they learn about a variety of adaptations (structures and behaviors) that animals use to survive in their environments. They can select an animal and describe its specific adaptations. | -Teacher Observation  
-Journal Entry | Multiple class periods |
| **3** Animal Groups (1 vertebrate class per session: Mammals, birds, reptiles, fish, amphibians) | Over multiple sessions, students learn the representative characteristics of five groups of vertebrate animals. Students can illustrate representatives of each group and describe physical characteristics (structures) that differentiate them from other animals. Students also observe similarities and differences between mature animals and their young, including form (e.g. frog and tadpole) and coloration (e.g. camouflage color/pattern of young). Students can match illustrations of animals and their young, and can explain observable differences. | -Teacher Observation  
-Journal Entry | 5 class periods |
| **4** Animal Adaptations: Camouflage Inquiry | Students can collect and organize data into categories, show how many in each category, and answer questions about the data. Students can explain how shapes, colors, and patterns help animals survive in their environments. | -Teacher Observation  
-Team data collection sheet  
-Journal Entry | 2 class periods |
| **5** Camouflage Critter | Students can use patterns and/or color to demonstrate an understanding of camouflage as a protective adaptation in animals. Students can measure a critter using standard or non-standard units. Students can describe the critter and can explain their choices of colors and patterns through speaking and writing. | -Product (gecko)  
-Written/spoken description/explanation | 1 class period |
| **6** Engineering Design Process: Climbing Critter | Students can design, build, and test a product using the EDP, and then redesign to improve the product. Students can measure distance traveled (length) using standard or non-standard units. | -EDP Student Journal | 2-3 class periods |
| **7** Plant Adaptations | Students demonstrate understanding that, like animals, plants also have adaptations including different shapes and structures involving stems, roots, and leaves. | -Journal entry | 1 or more class periods |
### Background Information for the Teacher

Engineering is one component of STEM that helps to build 21st Century Skills. Students enhance products using the Engineering Design Process that help to better our world. In the engineering design component of this unit, students will focus on the 6 steps of the **Engineering Design Process (EDP)**. The six steps of the EDP are: Ask, Imagine, Plan, Create, Experiment, and Improve. Students will learn the EDP and how to implement it by utilizing the science, math, and the technology content knowledge. Students will also use the GLOs to help them to practice cooperative skills as they work and consult with their engineering design teams to optimize their products. Students will be going through the EDP as they build their climbing critters.

### Resource Materials

- **Literature and trade books on various animals**
  - *The Mixed-Up Chameleon* by Eric Carle
  - *Fur, Feathers and Flippers: How Animals Live Where They Do* by Patricia Lauber
  - *Fish is Fish* by Leo Lionni

- **Web-based Inter-actives:**
  - Plants and animals in the environment: [http://www.bbc.co.uk/schools/scienceclips/ages/6_7/plants_animals_env.shtml](http://www.bbc.co.uk/schools/scienceclips/ages/6_7/plants_animals_env.shtml)
    - Lesson 1: Level “Medium” Living/Non-Living
    - Lesson 2: Level “Hard” Adaptations
    - Lesson 3: Level “Really Hard” Animal Groups
  - Build a Fish Interactive: [http://sv.berkeley.edu/showcase/flash/fish.html](http://sv.berkeley.edu/showcase/flash/fish.html)
  - Discovery Education Animation: Camouflage
  - Discovery Education Exploration: Response to Environment

- **Discovery Education Video: Animal Features and Their Functions (11:53)**
- **Discovery Education Video Segment: Forms of Animal Adaptations (1:36)**
- **Discovery Education eBook: The Tallest Animals on Land**
- **Discovery Education Images: Camouflage (several examples)**
- **Discovery Education Video Segment: A Butterfly’s Trick to Survive (Magic School Bus 2.32)**

Cover Image from: www.public-domain-image.com
**Unit Title:** How Plants and Animals Survive  
**Lesson Title:** What is an Environment?  
**Date Last Revised:** June 14, 2013  
**Unit Author(s):** B. Jennings, L. Lum, K. Umeda [Adapted from Arakaki, Kamiya, Munemitsu, and Umeda (04/11/11)]  
**Lesson #:** 1  
**Grade Level:** 1  
**Primary Content Area:** Science  
**Time Frame:** 1 – 2 class periods

### DESCRIPTION
In this lesson, students learn what is meant by an “environment” as they observe, collect, organize and analyze data about living and non-living things found on the school campus. In the classroom, students compare and contrast characteristics of things found on the school campus through sorting and counting activities based on their data. A journal entry that includes drawing and writing provides formative information to the teacher.

### PLANNING (Steps 1, 2, & 3)

#### 1. Standards/Benchmarks and Process Skills Assessed in this Lesson

**HCPS III: Science**  
*Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.*

- **SC.1.1.1:** Collect, record, and organize data using simple tools, equipment, and Science techniques safely (L1)  
- **SC.1.1.2:** Explain the results of an investigation to an audience using simple data organizers (L2)

**CCSS: Math**

- **CCSS.Math.Content.1.NBT.A.1:** Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.  
- **CCSS.Math.Content.1.MD.C.4:** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

**CCSS: Language Arts**

- **CCSS.ELA-Literacy.W.1.2:** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.  
- **CCSS.ELA-Literacy.SL.1.1:** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.  
  a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).  
  b. Build on others’ talk in conversations by responding to the comments of others through multiple exchanges.  
  c. Ask questions to clear up any confusion about the topics and texts under discussion.  
- **CCSS.ELA-Literacy.SL.1.4:** Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.  
- **CCSS.ELA-Literacy.SL.1.5:** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.  
- **CCSS.ELA-Literacy.SL.1.6:** Produce complete sentences when appropriate to task and situation.
### 2A. Criteria: What Students Should Know and Be Able to Do:

Students can:
- Make, record, and share observations made about an environment
- Sort and classify components of the environment as living/non-living; plant/animal
- Explain what is meant by an environment

### 2B. Assessment Tools/Evidence:

**Formative:**
- Teacher’s anecdotal notes based on observations about student participation
- Group data chart
- Student Journal Entry

### 3. Learning Experiences (Lesson Plan)

**Driving Question:** What is an environment?

**Vocabulary:**
- Environment
- Characteristics
- Sort
- Classify
- Category

**Materials:**
- Clipboards
- Sticky Notes
- Pencils
- Hand lens

**Handouts/Other Resources:**
- See Sample Student Journal for this unit

**Procedure:**
- Explain to students that an “environment” is an area that includes both living and non-living things. Today they will be going on a nature walk to discover what living and non-living things can be found in their schoolyard environment. Emphasize that they are going to be scientists and that their task is to make careful observations and to record what they see using the sticky notes on their clip boards. Instruct students to write the name of only one item per sticky note. Review the safe use of the hand lens.

- Take students outside and identify the physical boundaries of the specific schoolyard area they will be working in. Instruct students that they will have 20-30 minutes to make observations. Prompt students to observe conditions (wet, dry, sunny, shady, etc.) in different areas of the schoolyard, as well as the living and non-living things they find in those areas.

- Come back to the classroom and have students share the items they wrote on their sticky notes with the entire class by posting them on a class chart.
• Discuss how certain items might be grouped together. Identical items may be stacked on top of each other.

• Guide students to sort sticky notes into living and non-living things. Make a connection between the concepts of sorting and classifying. Discuss and have the students come to a conclusion about how these observations have been sorted.

• Among sticky notes that have recorded living things, ask students to describe how any two are alike and/or different. For example, “both need water in order to live” or “one is long and skinny (worm) and one has legs (beetle).”

• Ask students, “Based on all of the items they observed and how they were classified, what questions or wonderings do they have now?”

• Record student responses on a class chart.

• Ask students to draw and tell about the schoolyard environment in their journals. They should draw at least 3 living things (plants and/or animals) and 3 non-living things and tell how they are alike and different.

Math Activity:
• Ask students to count the number of items in each group on the chart, for example: How many living things? How many non-living things? How many plants? How many animals? Which group has more? Which has less? Repeat the counting exercise using different sorts.

• Ask students to draw one sorting activity in their science or math journal, including labels for each category, and the number of items in each group.

<table>
<thead>
<tr>
<th>TEACHING &amp; ASSESSMENT (Steps 4, 5, 6, &amp; 7)</th>
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4. Teaching and Collecting of Evidence of Student Learning:
Teacher Notes:

5. Analysis of Student Products/Performances - Formative:
Teacher Notes:

6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):
Teacher Notes:

7. Teacher Reflection: Replanning, Reteaching, Next Steps:
Teacher Notes:
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<th>RUBRIC: Student Journal Entry 1</th>
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<tbody>
<tr>
<td><strong>Drawing</strong></td>
<td>Draws fewer than 2 living and 2 non-living things.</td>
<td>Illustrates at least 2 living and 2 non-living things.</td>
<td>Illustrates at least 3 living and 3 non-living things.</td>
<td>Clearly illustrates at least 3 living and 3 non-living things with details.</td>
</tr>
<tr>
<td><strong>Science Content</strong></td>
<td>Unable to clearly distinguish between living and non-living things.</td>
<td>Identifies no more than 2 living things and 2 non-living things and/or is able to identify objects from only one category (e.g. living)</td>
<td>Correctly identifies at least 3 living things and 3 non-living things.</td>
<td>Correctly identifies and classifies at least 3 living things and 3 non-living things.</td>
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<td><strong>Writing Skills</strong></td>
<td>Intended meaning is not discernible and/or words/phrases are used in place of sentences.</td>
<td>Intended meaning is somewhat unclear and/or sentences are incomplete.</td>
<td>Describes likenesses and differences between at least 2 objects, using complete sentences.</td>
<td>Describes objects as living or non-living and explains likenesses and differences between 3 or more, using complete, detailed sentences.</td>
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DESCRIPTION

In this lesson, students review the needs of plants and animals and use data collected from the campus walk activity (Lesson 1) and from other resources to consider how animal body parts or “structures” help them survive in different parts of the environment, such as on the ground, in the air, in trees and plants, and in water. Students build vocabulary and background knowledge as they learn about many different kinds of animals over a period of several days.

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

   HCPS III: Science
   Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.

   • SC.1.4.1: Describe how living things have structures that help them to survive (L2)
   • SC.1.5.2: Describe the physical characteristics of living things that enable them to live in their environment (L1)

   CCSS: Language Arts

   • CCSS.ELA-Literacy.W.1.2: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
   • CCSS.ELA-Literacy.SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
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   • CCSS.ELA-Literacy.SL.1.5: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
   • CCSS.ELA-Literacy.SL.1.6: Produce complete sentences when appropriate to task and situation.

2A. Criteria- What Students Should Know and Be Able to Do:

   Students can-
   • Make and describe observations about structures of animals that help them survive.
   • Explain how structures including body shapes, colors, and patterns help animals survive in their environments.
   • Select and illustrate one animal in an environment. Describe at least two distinct adaptations (structures or behaviors) this animal uses to help it survive in the environment.
### 2B. Assessment Tools/Evidence:

**Formative:**
- Teacher’s anecdotal notes based on observations about students’ participation
- Journal entries

### 3. Learning Experiences (Lesson Plan)

**Driving Question:** How do the physical characteristics of organisms enable them to survive in their environments?

**Vocabulary:**
- Environment
- Characteristic
- Adaptation
- Structure
- Behavior
- Names of animals

**Materials:**
- Animal picture cards (as well as classroom pets and campus “wildlife” if available to study safely (grasshopper, walking stick insect, anole lizard, etc).
- Note: If children are involved in collecting schoolyard animals for observation, it is important to make sure they 1) ask an adult to okay the selected animal first, 2) have learned and practiced appropriate safety precautions (wearing gloves, using nets, containers, etc. without harming themselves or the animals).

**Handouts/Other Resources:**
- Literature and trade books on the various animals, examples:
  - *The Mixed-Up Chameleon* by Eric Carle
  - *Fur, Feathers and Flippers: How Animals Live Where They Do* by Patricia Lauber

- Web-based Inter-actives:
  - Plants and animals in the environment [http://www.bbc.co.uk/schools/scienceclips/ages/6_7/plants_animals_env.shtml](http://www.bbc.co.uk/schools/scienceclips/ages/6_7/plants_animals_env.shtml)
  - Discovery Education Animation: Camouflage
  - Discovery Education Exploration: Response to Environment

- Discovery Education Video: Animal Features and Their Functions (11:53)
- Discovery Education Video Segment: Forms of Animal Adaptations (1:36)
- Discovery Education eBook: The Tallest Animals on Land
- Discovery Education Images: Camouflage (several examples)
- Discovery Education Video Segment: A Butterfly’s Trick to Survive (Magic School Bus 2.32)

**Procedure:**

**Introductory lesson: Whole group discussion**

- Prompt students to think about what plants and animals need in order to survive:
  - Plants—air, sunlight, water
  - Animals – air, water, sunlight, food, shelter, defense
In addition to physical characteristics, explain that plants and animals have behavioral characteristics that include how they move. For example, animals have different ways of moving that include running, crawling, swimming, jumping or hopping, and flying. Plants orient themselves toward light sources and may have growing habits that include winding around support structures; or seed dispersal mechanisms that include seed pods that pop open.

Using students’ sticky notes from campus observations in Lesson 1, have students recall the animals they observed on campus, and tell where they saw the animal and how it moved. Was it on the ground, in the air, on a plant, or in water? Did it swim, hop, fly, run or crawl? Prompt students’ thinking by asking if questions such as, can a mongoose fly in the air? Can a mynah bird swim in a pond? Show pictures of other animals and ask students to tell or guess where the animal lives and how it moves. Ask what body parts enable certain animals to live or move in places where other animals cannot live. Include many commonly pictured animals such as dog, cat, goldfish, elephant, rabbit, frog, bee, spider, grasshopper, etc.

Help students understand that different kinds of animals have different body parts that enable them to survive in their environments.

Continue the learning

Over a period of several days, provide students with multiple opportunities to learn about animals in their environments by browsing through fiction and non-fiction picture books, viewing web-based resources, or other means provided by the teacher. Through facilitated discussions and activities, encourage students to observe the physical characteristics of animals and use these as clues as to what the animal eats, how it grasps its food, how it protects itself, how it moves from place to place, protects its young, and other behaviors that affect its ability to survive.

Provide an abundance of materials as noted above and incorporate them into small and large group lessons. -- Example: Select an animal story to use as a read-aloud. After reading, ask students to discuss with a partner what adaptations the featured animal used to eat, move, protect itself, etc.
-- Example: Provide groups of animal picture cards to table groups, ask them to look at the animals’ body parts, sort them into groups with similar characteristics, and then explain the categories they sorted by and why.

Formative assessment

After multiple learning experiences, ask students to draw and write about an animal in their Journal or Science Notebook using the following prompt (see sample rubric below): Select and illustrate one animal you have learned about. Describe at least two distinct adaptations (structures or behaviors) this animal uses to help it survive in the environment.

Homework Activity (Optional):

“Bring an animal back to class”: Provide each child with a card to take home for research on a new animal (that has not yet been discussed in class). They can ask an adult, look at books they have at home, or go online to find information in order to: 1) Write the name of the animal on the card, provide picture if possible (e.g., drawing or photo from website); 2) Write at least one adaptation the animal uses in order to survive in
- Pin students’ cards to a bulletin board or assemble in a class book for the classroom library.

### TEACHING & ASSESSMENT (Steps 4, 5, 6, & 7)

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<tr>
<td>Teacher Notes:</td>
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### RUBRIC: Student Journal Entry 2

<table>
<thead>
<tr>
<th>Drawing</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Illustration is not specific to a particular animal.</td>
<td>Illustrates a specific animal.</td>
<td>Clearly illustrates a specific animal.</td>
<td>Clearly illustrates a specific animal showing at least 2 distinct adaptations.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Science Content</th>
<th>1</th>
<th>2</th>
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<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of adaptation is unclear, inaccurate, or missing.</td>
<td>Describes at least 1 adaptation of the selected animal.</td>
<td>Correctly describes at least 2 adaptations of the selected animal.</td>
<td>Correctly describes at least 2 adaptations of the selected animal with details.</td>
<td></td>
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<tr>
<th>Writing Skills</th>
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<td>Intended meaning is not discernible and/or words/phrases are used in place of sentences.</td>
<td>Intended meaning is somewhat unclear and/or sentences are incomplete.</td>
<td>Provides a clear description using complete sentences.</td>
<td>Provides a clear description using complete, detailed sentences.</td>
<td></td>
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</table>
DESCRIPTION

Over a period of several days, students learn distinguishing characteristics of five groups of vertebrate animals: Mammals, birds, reptiles, amphibians, and fish. 

NOTE: Lessons 2 and 3 might overlap, as both are designed to build students’ background knowledge through multiple learning experiences focused on observing animals’ similarities and differences.

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

   HCPS III: Science

   Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.

   - SC.1.4.1: Describe how living things have structures that help them to survive (L2)
   - SC.1.5.2: Describe the physical characteristics of living things that enable them to live in their environment (L1)
   - SC.1.5.1: Identify ways in which the same kinds of plants and the same kinds of animals differ (The beginning of plant and animal classification). (L2)

   CCSS: Language Arts

   - CCSS.ELA-Literacy.W.1.2: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
   - CCSS.ELA-Literacy.SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
     a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
     b. Build on others’ talk in conversations by responding to the comments of others through multiple exchanges.
     c. Ask questions to clear up any confusion about the topics and texts under discussion.
   - CCSS.ELA-Literacy.SL.1.4: Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
   - CCSS.ELA-Literacy.SL.1.5: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
   - CCSS.ELA-Literacy.SL.1.6: Produce complete sentences when appropriate to task and situation.

2A. Criteria- What Students Should Know and Be Able to Do:

   Students can-
   - Make observations about animal structures.
   - Compare and contrast distinguishing characteristics of vertebrate animal groups.
   - Describe differences between two classes of vertebrate animals by describing specific characteristics.
2B. Assessment Tools/Evidence:
Formative:
- Journal entries (See sample prompts)

3. Learning Experiences (Lesson Plan)
Driving Question: How do scientists classify animals based on their body structures?

Vocabulary:
- Vertebrate
- Features
- Characteristics
- Structures

Materials:
“What is...” posters or books that provide examples and descriptions of:
1) vertebrate animals: mammals, birds, reptiles, amphibians, fish, and
2) invertebrate animals: insects, worms, etc.

Note: You can create your own charts using images and info from the internet and/or information from ScienceSaurus, pages 101-115.

Also: “What is...” posters from Education Works

Handouts/Other Resources:
- Literature and trade books on the various animals

Procedure:
- Focus on one animal group (e.g., amphibian, reptile, fish, bird, mammals) each day.
- Show the students an array of examples of that particular animal group.
- Write the word “characteristic” on the board and define it as “a quality that describes a living thing or object” (ScienceSaurus, p. 417).
  - Using yourself or a student as an example, engage students to identify some of the characteristics we have (e.g., hair, arms, legs, hands, feet).
  - Make a connection to physical “features” and “structures”
- Have students use their observation and thinking skills to identify the general characteristics they have in common.
- Use the selected illustrations to confirm student observations and provide additional characteristics of that animal group.
- Provide additional pictures that show male vs. female differences in the same species, and others that depict adult animals and their young for the particular group. Discuss characteristics related to how animals have their babies (live birth or eggs; land or water) and care for their young. With some animal groups this will lead to a discussion of life cycle stages, especially for amphibious animals. With others it may lead to discussions of how patterns and colors on young animals help protect them from predators.

- Integrate the language arts by reading a story or non-fiction selection about each animal, for example *Fish is Fish* by Leo Lionni.

- As each group of vertebrate animals is introduced, have students draw and write in their journals (see sample student journal) to demonstrate understanding of the characteristics of the group.

**Homework Activity (Optional):**

- Ask students to interview family members to see how many animals of each group they can name (e.g. 1 group per night). Create a bulletin board or chart/poster for each vertebrate class, and invite students to write animal names on labels and post animal names and pictures (as available) on the charts without duplicating any previously posted labels. If labels are taped or pinned (not glued) they will be useful for other sorting activities in the future, such as sorting animals by habitat type, by continent, etc.

**TEACHING & ASSESSMENT (Steps 4, 5, 6, & 7)**

<table>
<thead>
<tr>
<th>Completed by teacher after instruction has taken place</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Teaching and Collecting of Evidence of Student Learning:</td>
</tr>
<tr>
<td>Teacher Notes:</td>
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<tr>
<td>5. Analysis of Student Products/Performances - Formative:</td>
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<td>6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):</td>
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<td>7. Teacher Reflection: Replanning, Reteaching, Next Steps:</td>
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<td>Teacher Notes:</td>
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<tr>
<td><strong>Drawing</strong></td>
</tr>
<tr>
<td><strong>Science Content</strong></td>
</tr>
<tr>
<td><strong>Writing Skills</strong></td>
</tr>
</tbody>
</table>
**Unit Title:** How Plants and Animals Survive  
**Lesson Title:** Animal Adaptations: Camouflage Inquiry  
**Date Developed/Last Revised:** June 14, 2013  
**Unit Author(s):** B. Jennings, L. Lum, K. Umeda [Adapted from Arakaki, Kamiya, Munemitsu, and Umeda (04/11/11)]  
**Lesson #:** 4  
**Grade Level:** 1  
**Primary Content Area:** Science  
**Time Frame:** 2-3 class periods

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### DESCRIPTION

Over a series of two to three sessions, students will conduct an inquiry to see how camouflage impacts an animal's ability to survive. They will 1) enact a scenario in which an animal catches “fish” of different colors, 2) organize and communicate data to show the number of fish caught of each color, and 3) analyze and make inferences from the data. Data will be collected by student pairs, then compiled and recorded on a class data chart. The teacher will facilitate a discussion and prompt students thinking by asking questions about the data and what it implies about the effect of camouflage on an organism’s survival.

### PLANNING (Steps 1, 2, & 3)

#### 1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

<table>
<thead>
<tr>
<th>HCPS III: Science</th>
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<tbody>
<tr>
<td><strong>SC.1.1.1:</strong> Collect, record, and organize data using simple tools, equipment, and Science techniques safely (L1)</td>
</tr>
<tr>
<td><strong>SC.1.1.2:</strong> Explain the results of an investigation to an audience using simple data organizers, e.g., charts, graphs, and pictures. (L2)</td>
</tr>
<tr>
<td><strong>SC.1.4.1:</strong> Describe how living things have structures that help them to survive (L2)</td>
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<tr>
<td><strong>SC.1.5.2:</strong> Describe the physical characteristics of living things that enable them to live in their environment (L1)</td>
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<tr>
<td><strong>SC.1.5.1:</strong> Identify ways in which the same kinds of plants and the same kinds of animals differ (The beginning of plant and animal classification). (L2)</td>
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<tr>
<th>CCSS: Math</th>
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<tbody>
<tr>
<td><strong>CCSS.Math.Content.1.OA.C.6:</strong> Add and subtract within 20, demonstrating fluency for addition and subtraction within 10.</td>
</tr>
<tr>
<td><strong>CCSS.Math.Content.1.NBT.A.1:</strong> Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.</td>
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<td><strong>CCSS.Math.Content.1.MD.C.4:</strong> Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
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#### 2A. Criteria: What Students Should Know and Be Able to Do:

Students can-

- Collect and organize data.
- Organize data into categories, and show how many in each category.
- Answer questions about the data.
- Explain how colors and patterns help animals survive in their environments.
2B. Assessment Tools/Evidence:
Formative:
- Teacher’s anecdotal notes based on observations about students’ participation
- Group data sheets
- Journal entries

3. Learning Experiences (Lesson Plan)
Driving Question: How does the characteristic of camouflage help organisms survive in their environments?

Vocabulary:
- Camouflage
- Predator
- Prey

Materials:
- Timer
- Student Data Recording Sheet (see attached)
- Set of materials for each pair of students (see below for options)
- A Color of My Own by Leo Lionni

Procedure:
PREPARATION:
The teacher will need to create sets of objects that can be used by children working in pairs to represent fish in a pond (see suggestions below). Materials may vary depending on what is most easily available and whether the reusable materials are preferred or not. To get meaningful data, it is important that one of the “fish” items is an exact color match for the item selected to represent the pond. One set should be provided for each pair of students.

Some options (choose 1 and provide a container for each set of students):
1) Pond: Bowl of macaroni dyed blue
   Fish: Lima beans dyed blue, green, red, and yellow – mixed in with the macaroni

2) Pond: Background: 9” x 12” construction paper (blue)
   Fish: 2 cm colored paper squares in four colors (e.g. red, yellow, blue, green), 10 of each color (40 total) – pre-counted and placed in a baggie.

NOTES: Option #2 is attractive because construction paper is generally a no-cost item and there will be an exact match between the color of background (blue) and blue pick-up squares. Students can glue the paper squares directly onto their data collection worksheets. However, it requires prep time to cut and count out the paper squares for each set of students to use. For purposes of the remainder of this discussion, option 2 will be assumed.

ACTIVITY SET-UP:
- When the students are not in the room (e.g., recess or lunch break), place a sheet of colored construction paper on each student’s desk. Spread 40 paper squares (10 of each color – red, yellow,
blue, and green) on the sheet so that colors are mixed up and are evenly dispersed on the construction paper sheet.

- Consider covering the materials with a sheet of newsprint so there is minimal possibility of studying the arrangement of the paper squares before the investigation begins.

SESSION 1.1: DATA COLLECTION:

Data collection may be done as a whole group activity or by designated pairs of students at an activity center. In either case, the teacher will need to explain the procedures to the class so that everyone understands how to accurately collect and record the data. The description that follows assumes that the data will be collected and recorded as a whole group lesson.

- Have students gather on the floor or at other seating area as they enter the room.

- Review what was learned in the previous day’s lesson.

- Tell students that today we will learn more about how adaptations of organisms help them to survive in their environments. Show a picture of a heron and ask students how this bird looks different than other birds they have seen. Ask if the bird’s appearance gives them clues about the environment it might live in and what it eats. As needed, prompt students’ thinking by giving clues—e.g. this bird lives near water and eats marine animals including snails and fish. Ask students if they can think like scientists to determine what structures on this bird will help it live in its environment (long legs, long neck, long pointed beak).

- Explain that students will do an activity in which they play the part of a hungry heron that catches fish in a lake. Explain the rules of the activity:
  - On each desk, under the newsprint sheet there is a “lake” represented by a piece of colored construction paper, with “fish” in the lake represented by squares of different colors scattered across the paper lake.
  - Students will take turns playing the part of the heron and being the timer for the activity.
  - Each “heron” will have 20 seconds (adjust time frame as needed) to catch as many fish as possible.
  - The heron may use only one hand to catch his or her “fish” from the lake and may only catch one fish at a time.
  - Emphasize that students are to gather “fish” from all over the sheet and not just in one place or in one corner.
  - The timer will remove the newspaper sheet when the “go” signal is given and will then count time for the heron. (Ideally- Project the image of a live timer on the board so it can be easily seen by the children.) The child who is the timer will call out the numbers as they change so that the heron knows when to stop fishing. Alternatively, the teacher can count down the time for the students.
  - When the heron has finished catching his or her paper “fish”, they should be placed in a provided cup. The timer and heron can then switch places to repeat the activity, with the new heron attempting to catch additional “fish” (Keep the fish caught by the first heron in the cup).
• After explaining the rules, have two children model the activity so everyone understands what to do.
  - Tell students they will be excused to stand in front of their desks, but they are not to touch anything until the signal is given. When students are given the “go” signal, the timer can remove the newspaper sheet and the heron can begin to fish. The heron must stop when the timer or teacher calls out that time is up.
  - After both children have taken their turns as the heron, they must stop collecting fish and save their “data” (fish in the cup). Any fish remaining in the lake must stay there.

SESSION 1.2: ORGANIZING THE DATA (MATH)
• Students will need to refer to the fish still in the lake as part of the data recording process. They might move the lake to the top of their desks as they sort and record the number of fish that were caught.

• Demonstrate to students how to combine the paper “fish” caught by both students and then sort them into color groups. After sorting the fish, students may glue the paper squares on the provided worksheet to create bar graphs that show the number of fish caught by color. (If you wish to re-use the materials, have students mark an “X” in the boxes on the worksheet to represent the number of fish caught in each color group.)

• Guide students to count and record their data as indicated, and then complete the equations on the provided worksheet.

• Have groups discuss and then share their data with other pairs of students to answer questions such as “Which color of fish was caught the most frequently?” “Which was caught the least frequently?” Guide students to identify patterns and generalizations.

• Collect data sheets from each group.

SESSION 2: DATA REPORTING AND ANALYSIS (MATH, SCIENCE)
Teacher preparation: Transfer data from student data sheets to a large chart with data compiled for the whole class.

• Using this chart, have students engage in various counting activities (count data by 2s, 5s; describe how many more, how many less; etc.) and facilitate a discussion to help students find additional patterns and generalizations.

• Help students conclude that their findings are an example of how camouflage affects an organism’s survival and define it as “the shape, color, or pattern of an animal that helps it blend in with its surroundings” (blue ScienceSaurus, pg. 443).

• Direct students to write in their journals in response to prompt #4, in which they describe their experience catching fish and tell how camouflage helps animals survive.

• Read: A Color of My Own by Leo Lionni and discuss the role of camouflage in the story.

Extension: Provide opportunity for students to use Build a Fish Interactive to explore various fish habitats and adaptations. [http://sv.berkeley.edu/showcase/flash/fish.html](http://sv.berkeley.edu/showcase/flash/fish.html)
TEACHING & ASSESSMENT (Steps 4, 5, 6, &7)
Completed by teacher after instruction has taken place

4. Teaching and Collecting of Evidence of Student Learning:
Teacher Notes:

5. Analysis of Student Products/Performances - Formative:
Teacher Notes:

6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):
Teacher Notes:

7. Teacher Reflection: Replanning, Reteaching, Next Steps:
Teacher Notes:

<table>
<thead>
<tr>
<th>RUBRIC: Student Journal Entry 4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Writing: Science Content</strong></td>
<td>The student cannot explain how camouflage can help the animal survive.</td>
<td>The student gives an incoherent or incorrect explanation of how camouflage can help the animal survive.</td>
<td>The student can explain in writing, at least 1 way in which camouflage can help the animal survive.</td>
<td>The student can explain in writing, at least 2 ways that camouflage can help the animal survive.</td>
</tr>
<tr>
<td><strong>Writing Skills</strong></td>
<td>Description of activity is not discernible and/or words/phrases are used in place of sentences.</td>
<td>Description of activity is somewhat unclear and/or sentences are incomplete.</td>
<td>Provides a clear description of the activity using complete sentences.</td>
<td>Provides a clear description of the activity using complete, detailed sentences.</td>
</tr>
</tbody>
</table>
Great Blue Heron

http://upload.wikimedia.org/wikipedia/commons/2/2d/Myakka_River__Great_Blue_Heron.jpg
**Data Collection**

**Directions:**

After catching your fish, show how many of each color you caught by coloring in the matching number of squares in each column, starting from the bottom of the page.

**Example:**

4 fish

<table>
<thead>
<tr>
<th>Blue</th>
<th>Green</th>
<th>Red</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Summary

The color of our lake is ________________________________.

<table>
<thead>
<tr>
<th>Fish Color</th>
<th>How Many Caught?</th>
<th>How Many Remain in the Lake?</th>
<th>Total (How Many in All?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observations about the data:

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
**Unit Title:** How Plants and Animal Survive  
**Lesson Title:** Camouflage Critter  
**Date Developed/Last Revised:** June 10, 2013  
**Unit Author(s):** B. Jennings, L. Lum, K. Umeda [Adapted from Arakaki, Kamiya, Munemitsu, and Umeda (04/11/11)]

**Description**

In this lesson, students continue to build background knowledge about animals, environments and adaptations as they learn more about animal camouflage as an adaptation for survival. The teacher will use a variety of pictorial material and digital resources as available to provide examples for students to view. To demonstrate their understanding of camouflage, students will create a camouflage covering for a provided cardstock gecko, measure the gecko, and explain how colors and patterns can help an animal to survive. The completed gecko will be used in the next lesson as part of an engineering design task.

**Planning (Steps 1, 2, & 3)**

1. **Standards/Benchmarks and Process Skills Assessed in this Lesson:**

   **HCPS III: Science**
   
   Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.

   - **SC.1.4.1** Describe how living things have structures that help them to survive (L2)
   - **SC.1.5.2** Describe the physical characteristics of living things that enable them to live in their environment (L1)
   - **SC.1.5.1** Identify ways in which the same kinds of plants and the same kinds of animals differ (L2) (The beginning of plant and animal classification)

   **CCSS: Language Arts**

   - **CCSS.ELA-Literacy.W.1.8:** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
   - **CCSS.ELA-Literacy.RI.1.7:** Use the illustrations and details in a text to describe its key ideas.
   - **CCSS.ELA-Literacy.RI.1.10:** With prompting and support, read informational texts appropriately complex for grade 1.

2A. **Criteria - What Students Should Know and Be Able to Do:**

   Students can-
   
   - Demonstrate an understanding of camouflage by using patterns and/or colors to match a cardstock gecko to a selected background
   - Describe how camouflage coloring helps an animal hide in its environment to increase its chances of survival
   - Use standard or non-standard units to measure and record the length of their gecko
   - Describe the gecko (length) and explain their choices of colors and patterns through speaking and writing
2B. Assessment Tools/Evidence:
Formative:
- Completed gecko, with color and design
- Journal entries

3. Learning Experiences (Lesson Plan)
Driving Question: How do the physical characteristics of organisms enable them to survive in their environments?

Materials:
- Images of different geckos to show a variety of colors and patterns (see Wikipedia and Google Images)
- Pre-cut gecko shapes on tag board (use provided pattern)
- Art materials (paint, markers, and/or crayons)
- Measurement tools for length (standard or non-standard, such as rulers, linking cubes, or other similar items)

Handouts/Other Resources:
- Many images showing a variety of camouflaged animals in their environments

Procedure:
- Show students pictures of a common gecko and ask them to tell you what they know about these animals. Students should be able to tell you that geckos can easily climb up walls. Explain that geckos are able to do this because of very special adaptations on their feet that enable them to stick to different surfaces (show picture of gecko foot).

- Explain that, in addition to the gecko we commonly see, there are many other species of geckos that live in different places around the world. Geckos come in different shapes, sizes, colors and patterns that help them survive in different environments. Show students pictures of different geckos, one at a time, and ask them to think about what background each gecko might sit on to hide from predators or to sneak up on insects it would like to eat. Encourage students to think about the relationship between an animal’s surroundings and the way it looks.

Note: Numerous images can be found by searching Google Images for “gecko photos”. Select a variety to show different shapes, colors, and environmental conditions.

- Provide students with materials, share the following scenario and instructions, and demonstrate how to color a gecko to match a particular background:

SCENARIO: You are a biologist who studies animal structures, including camouflage coverings. Help! Gabby Gecko wants to come out and catch bugs, but she does not want to be caught and eaten by another animal. She needs your help to hide her from her enemies.
• First, choose an environment for her (tree trunk? sand dune? speckled rock? – Use your imagination!) and color a large area on your paper to represent the environment. Then lay your gecko on top of the background you have created and camouflage her by coloring her with similar patterns or colors so that she will be hard for other animals to see. Your camouflage will protect her from her enemies AND help her sneak up on bugs to catch them for her dinner.

• When you are finished coloring her, find out how long she is by measuring her with the tool of your choice.

• Be prepared to tell someone else how long she is, and how your choice of colors and patterns will protect her from being eaten by other animals, and then write your explanation in your science journal.

Extension: Provide a variety of fabrics or papers with very simple patterns from which children may choose as a background to match for their geckos. Students can copy the selected pattern on their geckos (or- you can allow them to cut and glue pieces of the selected background directly onto the gecko shape). The idea is to camouflage the gecko so it can “hide” against the selected background.

<table>
<thead>
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<th>TEACHING &amp; ASSESSMENT (Steps 4, 5, 6, &amp; 7)</th>
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<th>RUBRIC: Student Product and Journal Entry 5</th>
</tr>
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<tbody>
<tr>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>Product</strong></td>
</tr>
<tr>
<td><strong>Journal Entry: Writing</strong></td>
</tr>
<tr>
<td><strong>Journal Entry: Math</strong></td>
</tr>
</tbody>
</table>
The toes of the gecko have a special adaptation that allows them to adhere to most surfaces without the use of liquids or surface tension. A recent discovery shows that geckos have a special secretarial gland that allows them to absorb and excrete liquid to allow for maximum adherence to surfaces. Wikipedia – “Gecko Feet”
Unit Title: How Plants and Animals Survive  
Lesson Title: Engineering Design Process: Climbing Critter  
Date Developed/Last Revised: June 10, 2013  
Unit Author(s): B. Jennings, L. Lum, K. Umeda

[Adapted from Arakaki, Kamiya, Munemitsu, and Umeda (04/11/11)]

Lesson #: 6  
Grade Level: 1  
Primary Content Area: Science  
Time Frame: 2-3 class periods

**DESCRIPTION**

Students engage in the Engineering Design Process (EDP) as they are challenged to design a method to make their “critters” (geckos) climb to reach a food source. Students are guided through each step of the process as they complete the provided Engineering Design Process Journal. Designing, testing, and re-designing to improve the product are important aspects of the process and may require multiple sessions to complete.

**PLANNING (Steps 1, 2, & 3)**

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

HCPS III: Science

Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.

- **SC.1.1.1** Collect, record, and organize data using simple tools, equipment, and science techniques safely (L1)
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- **SC.1.4.1** Describe how living things have structures that help them to survive (L2)
- **SC.1.5.2** Describe the physical characteristics of living things that enable them to live in their environment (L1)
- **SC.1.5.1** Identify ways in which the same kinds of plants and the same kinds of animals differ (L2) (The beginning of plant and animal classification)

CCSS: Language Arts

- **CCSS.ELA-Literacy.W.1.1**: Write an opinion piece in which they introduce the topic or the name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure. W.K.2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
- **CCSS.ELA-Literacy.W.1.2**: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
- **CCSS.ELA-Literacy.W.1.8**: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- **CCSS.ELA-Literacy.SL.1.1**: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
  - a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
  - b. Build on others’ talk in conversations by responding to the comments of others through multiple exchanges.
  - c. Ask questions to clear up any confusion about the topics and texts under discussion.
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- **CCSS.ELA-Literacy.SL.1.5**: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
• **CCSS.ELA-Literacy.SL.1.6:** Produce complete sentences when appropriate to task and situation.

**CCSS: Math**

• **CCSS.Math.Content.1.MD.C.4:** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
• **CCSS.Math.Content.1.NBT.A.1:** Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

**2A. Criteria- What Students Should Know and Be Able to Do:**

Students can-
- use the EDP to test designs for making the critter (gecko) climb along a predetermined path.
- measure distance traveled (length) using standard or non-standard units.
- record, organize, and explain measurement data to conclude which of the selected engineering designs was most effective.

**2B. Assessment Tools/Evidence:**

**Formative:**
1) Teacher observations: individual observations of students’ grasp of EDP
2) Student self-assessment checklist on Engineering Design Process (EDP)
3) Individual Student Goal sheets on understanding of EDP with teacher feedback (use rubric)
4) Completion of Student Engineering Design Process Journal
5) Product – Climbing Critter

**3. Learning Experiences (Lesson Plan)**

**Materials:**
- Colored Gecko from previous session
- Chopsticks
- String
- Straws
- Tape
- Measurement tools for length (standard or non-standard, such as rulers, linking cubes, or other similar items)
- Climbing Critter Graph Sheet
- Climbing Critter EDP Journal

**Handouts/Other Resources:**
- Steps in the Engineering Design Process (written on board or poster)

**Procedure:**
1. **Hook:** Show a stuffed animal. What are the structural parts of this animal? How does this animal use each structural part? Where does he live? What is that environment like? How does each structural part help this animal to survive in its environment? (review science knowledge)

2. **Performance task: (What students will be doing)**
   **SCENARIO:** You are a biologist who studies animal structures. Today, your job is to help your gecko climb quickly up a pathway so it can catch bugs to eat. The camouflage you have given her will help her sneak up on the bugs and catch them before they can get away! Happy building!
3. Pre-assessment of Engineering Design Process:
Question: If you were an engineer, what steps would you take to improve this pen? What do you wish this pen could do or have on it that would make it easier to use or more fun? (show a pen to students) Teacher prompts/guides students to think about their thinking and action steps that they would take to solve this problem. Guide students to seeing that their natural approach (or thinking process) is very similar to the Engineering Design Process that they will be experiencing as they create their climbing critter.

4. Engineering Design Process
a) You are now ready for the design challenge of building your own climbing gecko!
b) Show examples/non-examples of climbing critters that they will be building. Notice the position of the straws and notice the direction and speed of how the critters climb.
c) Students will be going through the Engineering Design Process as they build these climbing geckos.

Question: How can I design my climbing gecko so that it will move quickly and easily up the pathway?

Pass out Climbing Critters Engineering Design Process Journal. Have students flip through the pages of the journal and pick out the steps of the Engineering Design Process. What are the 6 steps? What do you think is involved in each step? What does this process help you to do? (Answer: EDP helps to create something that works to meet your needs and answers your problem in an organized thinking manner)
d) Show students EDP Criteria Checklist (on chart) This is a summary of EDP criteria that shows students what they need to know, do, and reflect upon as they go through the EDP when building their climbing gecko.
e) Have class fill in their Climbing Critter Journals together one step at a time as they are going through the EDP process. Teachers write down observations and monitor student progress as they go through the EDP.

Ask:
Show students the exemplars and materials that they will be using to build their gecko. Show students pictures of a variety of environmental conditions that geckos live in. Students orally ask questions that they may have. Teacher leads a discussion and answers questions. Teacher may write questions on the board and students may copy a question from the board or they can write their own depending on their writing abilities. Teacher and students look at EDP checklist to see if they are on the right track.

Imagine:
How would you color and design your gecko so that it would camouflage into different environmental conditions? Show students the different positions of the straws that are located on the backside of each critter. Which way would you place the straws so that would help the gecko to move quickly? Students circle how they will place the straws on their critter. Teacher and students look at EDP checklist to see if they are on the right track.

Plan:
Students plan how to place and fasten the straws on their geckos. Tell students that the straws must be taped onto the dots located on the backside of their geckos in whatever position they chose. Draw the top view of their gecko. Draw the back view of their gecko and show where straws will be placed. (see example)

Create:
Have students build their climbing geckos. Color their geckos and tape the straws onto the dots. The picture that they drew should match their critter. Teacher and students look at EDP checklist to see if they are on the right track.
**Experiment:** Test it out!
Teacher passes out “Climbing Critters Pathway,” one to each pair of students. Show students how to thread their critters onto the pieces of string. One partner holds the Pathway while the other person pulls each string alternately downwards to move their critters. Practice until all of the students can make their animal move up the string. Once everyone knows how to move their animal, you may time them. Mark the string where the nose of their gecko is with a black marker. Each partner positions their animal on the pathway with their nose below the black line on the string. When the teacher says, “Go!” Students start making their animals climb.

Meanwhile, teacher turns on the timer and calls out the seconds aloud. When the students reach the top, they listen for their time from the teacher and write that time next to Trial 1 on their graphing worksheet. Repeat again for Trial 2.

Fill in rest of worksheet (graphs and facts using knowledge from data lessons). Teacher and students look at EDP checklist to see if they are on the right track.
(NOTE: May go through “experimental and improvement” stages many times - if time or teacher permits.)

**Improve:**
Students discuss and write what worked/didn’t work with their climbing gecko. Students think if they need to reposition their straws to make their gecko move faster. Have students draw and label their new and improved designs. Teacher and students look at the EDP checklist to see if they are on the right track.

- Students remodel their climbing critters and go through the EDP cycle again. Fill in Trials 3 and 4 on the graphing worksheet and see if their redesign helped their critter move faster. Fill in the rest of the Climbing Critters EDP journals.

- Optional: Have a race to find out who has the fastest gecko.

**Reflect:**
Ask students to explain what they learned in this lesson by answering the prompting questions in their unit journals (Lesson 6).

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**TEACHING & ASSESSMENT (Steps 4, 5, 6, &7)**
Completed by teacher after instruction has taken place

4. Teaching and Collecting of Evidence of Student Learning:
Teacher Notes:

5. Analysis of Student Products/Performances - Formative:
Teacher Notes:

6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):
Teacher Notes:

7. Teacher Reflection: Replanning, Reteaching, Next Steps:
Teacher Notes:
Trial 1: Climbing Critters Engineering Design Process Journal

STEP 1: Ask
Problem: Design and build a climbing critter that will climb quickly up the food chain.
Materials/Criteria: Each person will be given a pattern, 2 straws, string, and tape.
Ask: Form questions about the project that you would like to know more about.

STEP 2: Imagine – These are the different ways you could place the straws on the dots.

Circle the way that you think will make your critter move up the food chain quickly.

STEP 3: Plan - Draw your prototype with labels.

Example:

STEP 4: Create- Build your critter.
**STEP 5: Experiment: Test it out!**

Graph: How long does it take for your critter to climb the food chain?  
(Graph your trials on the attached graph.)

**STEP 6: Improve: Make it better! What worked, what didn’t work, and why?**

<table>
<thead>
<tr>
<th>Straws</th>
<th>Body Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Imagine/plan:** Draw your final design. Make sure to label the structural parts of your design.  
**Example:**

**Front View:**
- eyes
- nose
- head
- flipper
- shell

**Back View:**
- mouth
- straws

**Experiment: Test it out! (Graph your trial on the attached graph.)**
Write at least 2 facts shown by the graph.

1. __________________________________________________________________________

2. __________________________________________________________________________

3. __________________________________________________________________________
Describe what worked and didn’t work with your climbing critter and explain why.
DESCRIPTION

Over a period of several days, students are provided with multiple opportunities to learn about plants in their environments by browsing through fiction and non-fiction picture books, viewing web-based resources, or other means provided by the teacher. Through facilitated discussions, students are encouraged to observe how differences in the leaves, stems and roots of plants are evidence of adaptations that enable plants to survive in different environments.

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

<table>
<thead>
<tr>
<th>HCPS III: Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: The “L” codes at the end of each benchmark refer the Marzano’s Taxonomic Level of Understanding, which the benchmark was assigned. So for example, “L3” refers to Taxonomic Level 3: Analysis.</td>
</tr>
</tbody>
</table>

- **SC.1.4.1** Describe how living things have structures that help them to survive (L2)
- **SC.1.5.2** Describe the physical characteristics of living things that enable them to live in their environment (L1)
- **SC.1.5.1** Identify ways in which the same kinds of plants and the same kinds of animals differ (The beginning of plant and animal classification). (L2)

<table>
<thead>
<tr>
<th>CCSS: Language Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>CCSS.ELA-Literacy.RI.1.1</strong>: Ask and answer questions about key details in a text.</td>
</tr>
<tr>
<td>• <strong>CCSS.ELA-Literacy.RI.1.7</strong>: Use the illustrations and details in a text to describe its key ideas.</td>
</tr>
<tr>
<td>• <strong>CCSS.ELA-Literacy.W.1.1</strong>: Write an opinion piece in which they introduce the topic or the name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure. W.K.2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.</td>
</tr>
<tr>
<td>• <strong>CCSS.ELA-Literacy.W.1.2</strong>: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.</td>
</tr>
</tbody>
</table>

2A. Criteria- What Students Should Know and Be Able to Do:

Students can-

- Make and describe observations about structures of plants that help them survive.
- Explain how differences in structures including roots, stems and leaves help plants survive in their environments.
- Select and illustrate one plant in an environment. Describe at least 1 feature that helps the plant survive in the environment.

2B. Assessment Tools/Evidence:

Formative:

- Teacher’s anecdotal notes based on observations about students’ participation
- Journal entries
3. Learning Experiences (Lesson Plan)

Driving Question: How do the physical characteristics of organisms enable them to survive in their environments?

Vocabulary: Parts of plants
- Leaf
- Stem
- Roots
- Branches
- Flowers
- Seeds

Materials:
- Several potted plants with different characteristics, such as 1) shade loving plant with large leaves, 2) dry area plant (e.g. cactus) with fleshy leaves and stems; 3) flowering plant with classic pinnate leaves, 4) bulb-grown plant with blade-like leaves.
- Numerous resources including images, fiction and non-fiction books, video clips and Discovery Education resources as noted.

Handouts/Other Resources:
- Literature and trade books on the various plants

Procedure:
- Place a number (1, 2, 3, 4) on each of the potted plants you have brought and display them where students can see them easily. Without giving students any information about the plants, provide them with an observation sheet and tell them you want them to study the plants like scientists, make careful observations, and prepare to tell someone else about their findings.

- Provide several minutes for students to observe the plants and make notes about them.

- Ask students to share their findings with a partner or table group, and compare notes about their observations. Provide a larger version of the observation sheet and ask each table to make a summary of their observations.

Reinforcement Activities: Provide an abundance of materials as noted above and incorporate them into small and large group lessons.

- Example: Provide groups of plant picture cards to table groups, ask them to sort their pictures, and then explain the categories they sorted by and why.

- Example: Select a story that features a particular environment (desert, rainforest, shoreline, alpine forest) to use as a read-aloud. After reading, ask students to describe the characteristics of plants and animals featured in the story, and call attention to characteristics that reflect an adaptation to the featured environment.

- Direct students to draw and write in their journals in response to the prompt for Lesson 7.
**TEACHING & ASSESSMENT (Steps 4, 5, 6, & 7)**
Completed by teacher after instruction has taken place

4. **Teaching and Collecting of Evidence of Student Learning:**
   Teacher Notes:

5. **Analysis of Student Products/Performances - Formative:**
   Teacher Notes:

6. **Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):**
   Teacher Notes:

7. **Teacher Reflection: Replanning, Reteaching, Next Steps:**
   Teacher Notes:

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**RUBRIC: Student Journal Entry 7**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drawing</strong></td>
<td>Illustration does not show a specific plant.</td>
<td>Illustrates a specific plant.</td>
<td>Clearly illustrates a specific animal with adaptations.</td>
<td>Clearly illustrates a specific plant showing at least 2 distinct adaptations.</td>
</tr>
<tr>
<td><strong>Science Content</strong></td>
<td>Description of adaptation is unclear, inaccurate, or missing.</td>
<td>Describes at least 1 adaptation of the illustrated plant.</td>
<td>Describes at least 2 adaptations of the illustrated plant in its environment.</td>
<td>Describes at least 2 adaptations of the illustrated plant in its environment with details.</td>
</tr>
<tr>
<td><strong>Writing Skills</strong></td>
<td>Intended meaning is not discernible and/or words/phrases are used in place of sentences.</td>
<td>Intended meaning is somewhat unclear and/or sentences are incomplete.</td>
<td>Provides a clear description using complete sentences.</td>
<td>Provides a clear description using complete, detailed sentences.</td>
</tr>
</tbody>
</table>
My Journal

How Plants and Animals Survive
1. Draw a picture that shows at least 3 living and 3 non-living things found in the schoolyard environment.

Tell about your picture. How are these things alike? How are they different?
2. Draw a picture of an animal that you have learned about.

Tell about your picture. What animal is this? What adaptations does this animal use to help it survive in its environment?
3a: Mammals. Draw 3 different mammals.

Tell about the animals in your picture. How are they alike? How are they different from other kinds of animals?

Tell about the animals in your picture. How are they alike? How are they different from other kinds of animals?
3c. Reptiles: Draw 3 different reptiles.

Tell about the animals in your picture. How are they alike? How are they different from other kinds of animals?

Tell about the animals in your picture. How are they alike? How are they different from other kinds of animals?
3e. Fish: Draw 3 different fish.

Tell about the animals in your picture. How are they alike? How are they different from other kinds of animals?
4. Draw and tell about your experience catching fish. Describe how camouflage helps animals survive in their environments.
5. Tell about your camouflage critter.

What is its name?

How long is it?

What colors and patterns did you use to design it?

How will the design of your critter help it survive in its environment?
6. Explain what you learned through practicing the engineering design process (EDP) with your climbing critter. How well did your first design work? What changes did you make as a result of testing your first design? Was your second design more successful?
7. Draw a plant with 2 or more adaptations that will enable it to survive in a particular environment. The environment you choose can be real or make-believe.

Describe your plant’s adaptations, tell what environment it lives in, and tell how its adaptations will help it to survive.