INSTRUCTIONAL PLANS

Suggested for Beginning of Year Review

Life Science Toolbox for Fifth Grade

Created by Michigan Teachers for Michigan Students

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# Fifth Grade Life Science Toolbox

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Letter of Introduction

Dear Educators,

While creating this toolbox, we spent a great deal of time worrying. We worried about:

- devoting enough time to reviewing the Benchmarks taught in previous grades;
- being developmentally appropriate;
- including just the right amount of best practice instructional activities;
- incorporating to, with, and by into the Day-by-Day lesson plans;
- interpreting and aligning the Benchmarks accurately;
- making the lessons interesting and motivating; and
- addressing the teaching and learning standards within the lessons.

We worried about everything, so you wouldn’t have to worry. We know teaching is a difficult profession at best and even more difficult when faced with increased academic standards and content expectations. We wanted to help you through this transition period by providing this easy to use model designed to prepare Michigan’s students for future statewide assessments.

We realize we are providing a way for you to prepare your students for the MEAP. We also understand the best way for students to prepare for the MEAP is through excellent instruction aligned to a carefully designed curriculum. With changing content expectations and statewide assessments, it has been challenging for schools and districts to keep pace. We offer this toolbox in light of the previous statements. We hope you will find, within these day-by-day lesson plans, instructional strategies, and pedagogical ideas you can use everyday of the school year. If you do, we have done our job. It means we have created more than MEAP preparation materials. It means we have influenced your instruction and possibly your curriculum.

St. Clair County teachers created this toolbox for use by Michigan teachers with Michigan students. It was a time consuming effort we hope other teachers find useful and will appreciate.

Sincerely,

Fifth Grade Toolbox Team

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Lisa Kent and Michael Larzelere – Port Huron Area School District
Thomas Pemberton and Steven Hunt – Yale Public Schools
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Monica Hartman, and Mike Maison – St. Clair County RESA
Important Notices

Michigan Curriculum Framework, Science Benchmarks

This new edition of the Fifth Grade Science Toolbox has five parts. The first part contains a practice test consisting of the released items from the Fall 2005 fifth grade Science MEAP, an answer sheet, an analysis grid, and a Power Point presentation of the questions. The second part is the Life Science Toolbox. The third part is the Physical Science Toolbox. The fourth part is the Earth Science Toolbox. The last part contains two videos for use with the Physical Science Toolbox.

The science toolboxes are a suggested review at the beginning of the year for Michigan’s fifth grade students. It is suggested that the students do the released items from the Fall 2005 test as a practice test. A copy of this test is found in part one of the Fifth Grade Science Toolbox. From this review, teachers can determine which benchmarks should be a focus of review for their class. In all toolboxes, an emphasis is placed on the constructing and reflecting benchmarks. We embed them in the Physical, Earth and Life Science content standards of the Michigan Curriculum Framework. Use of these toolboxes does not guarantee all benchmarks have been addressed.

The lessons are designed to make use of the “to”, “with”, and “by” format. First, you model the skills and strategies for your students. Modeling means explicitly showing how the skill or strategy is completed and all the thinking that goes on during its completion. Second, you help your students practice the skills and strategies. This help can be whole class, small group, or individual guidance. Third, you let your students complete the skills and strategies on their own. At the beginning of the toolbox practice you will model the inquiry process. You will think aloud as you ask the investigation question, make a prediction, graph data, interpret results and draw a conclusion. In the lessons that follow, students will be given opportunities to practice these skills with less and less intervention until they can do them on their own.

Each daily lesson is designed to engage the students for the full science period of 50-60 minutes. Remember that the toolbox is designed to be a review of content taught in kindergarten through fourth grade. Rather than taking the time to do most of the investigations themselves, they are graphing, analyzing, and interpreting data collected by the project teachers or other students. This is not the best way to teach science, but given the time constraints, this is the format we chose. In a few cases, pictures and videos were made of the data collection. The video clips are provided on a separate CD. We invite teachers to extend the full investigation to their students, when time permits.

We hope that some of the ideas presented will be springboards to further inquiry projects after the review period. We look forward to your suggestions and feedback.
Children do not learn by doing. They learn by thinking, discussing, and reflecting on what they have done.

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Lesson 6

Lesson Focus
- Using Physical Science
  Sound Energy

Lesson 9: Sound

IV. 4.E.1 Using Physical Scientific Knowledge
Describe sounds in terms of their properties.
Key concepts: Properties:
- Pitch—high, low,
- Loudness—loud, soft
Real-world contexts: Sound from common sources, such as musical instruments, radio, television, animal sounds, thunder, human voices.

IV. 4.E.2 Using Physical Scientific Knowledge
Explain how sounds are made.
Key concepts: Vibrations—fast, slow, large, small.
Real-world contexts: Sounds from common sources, such as musical instruments, radio, television, animal sounds, thunder, and human voices.

LESSON
In the first part of this lesson students will listen and watch the video of a record playing at 4 different speeds on a phonograph. This technology may be unfamiliar to some of the students, so you may want to discuss how a needle vibrating in the grooves of a record results in sound. The record, Country Road, sung by John Denver is played at the speed at which it was recorded – 33 revolutions per minute (rpm). The speed is changed to 16 rpm. The students can see that the record moves more slowly, so the needle vibrates more slowly. Slow vibrations result in a lower pitch. The speed is changed again to 45 rpm and then 78 rpm. As the record spins faster, the vibrations are faster and the pitch is higher.

The next activity will demonstrate the high and low pitch of sound. Fill a collection of bottles with water to varying heights. Tap the bottles with a metal spoon to start the vibrations of the bottle and the air molecules surrounding the bottle. The bottles with more water will have a lower pitch because the bottle will vibrate more slowly. Students have a difficult time with this because they cannot see the vibrations of the bottle or the air molecules. Help students see the connection between this and the activity with the record.

PROCEDURES

RESOURCES

Materials
- Sound
  - Video: Investigating the Pitch of Sound
  - Student Investigation Sheet - Sound
  - Bottles (3 per group)
  - Metal spoons (1 per group)

Vocabulary
- high pitch
- low pitch
- vibration
- loudness

How to Read a Lesson Plan Page

Identifies lesson focus and lists the activities and strategies for the day

Step-by-step instructions for lesson delivery
- Benchmark clarification with key concepts and real-world contexts
- Lesson description and management
- Procedures to follow
- Additional resources

Indicates lesson number for this toolbox.

Indicates vocabulary important for the benchmark.

Indicates everything you need to prepare for today’s lessons and activities
Materials Needed for Lesson Activities

Lesson 1
- Be sure the picture of the animal (salamander) on student journal page 1 is clear. If possible, make a colored overhead copy of this picture.
- Transparency of student journal page 3 or chart paper

Lesson 2
- Text resources or Internet for students' research of another animal's life cycle (i.e., mealworm, ladybug, fly, mosquito, praying mantis, bird)

Lesson 4
- Inherited traits survey from student page 9 completed as homework
- Transparency of student journal page 10, Group Results
- Transparency of student journal page 11, Making Bar Graphs
- Colored pencils for making a graph
- Coin to flip

Lesson 5
- One set of fossilization cards copied from teacher page 30. If your class size is very large (more than 28), you may need two sets of cards.

Lesson 7
- Set of food chain cards from teacher pages 38-41. (Attach magnetic strips if you have a magnetic blackboard)
- Yarn
- Tape

Lesson 8
- Computer lab or Classroom computers with Internet
- Stop watch or clock with a second hand
- Transparency of Class Data Sheet (Student Journal page 21) or Chart Paper
- Markers or colored pencils
- Optional: Copy of data from Teacher Toolbox page 51 if computers and the Internet are not available

Lesson 9
- One deck of Michigan Ecosystem Rummy cards for each group of four students. These can be found on the CD.
# Life Science Toolbox Overview

<table>
<thead>
<tr>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristics and Functions of Observable Body Parts</strong></td>
<td><strong>Animal Life Cycles</strong></td>
<td><strong>Plant Life Cycles</strong></td>
</tr>
<tr>
<td>Generate questions about the world based on observation.</td>
<td>Describe life cycles of familiar organisms</td>
<td>Describe life cycles of familiar organisms</td>
</tr>
<tr>
<td>Develop solutions to problems through reasoning, observation, and investigations.</td>
<td>Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics</td>
<td>Compare and contrast food, energy, and environmental needs of selected organisms</td>
</tr>
<tr>
<td>Construct charts and graphs and prepare summaries of observations.</td>
<td>Explain characteristics and functions of observable body parts in a variety of animals</td>
<td>Explain functions of selected seed plant parts</td>
</tr>
<tr>
<td>Develop an awareness of the need for evidence in making decisions scientifically.</td>
<td>Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics</td>
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<tr>
<td>Explain characteristics and functions of observable body parts in a variety of animals</td>
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<tr>
<td>Lesson 4</td>
<td>Lesson 5</td>
<td>Lesson 6</td>
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<tr>
<td><strong>Heredity</strong></td>
<td><strong>Evolution: Fossils</strong></td>
<td><strong>Evolution: Characteristics for Survival</strong></td>
</tr>
<tr>
<td>Develop strategies and skills for information gathering and problem solving</td>
<td>Explain how fossils provide evidence about the nature of ancient life.</td>
<td>Explain how physical and behavioral characteristics of animals help them to survive in their environments</td>
</tr>
<tr>
<td>Construct charts and graphs and prepare summaries of observations</td>
<td>Explain how rocks and fossils are used to understand the history of the earth.</td>
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<td>Give evidence that characteristics are passed from parents to young</td>
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<tr>
<td>Lesson 7</td>
<td>Lesson 8</td>
<td>Lesson 9</td>
</tr>
<tr>
<td><strong>Ecosystems: Food Chains and Food Webs</strong></td>
<td><strong>Adaptations</strong></td>
<td><strong>Basic Requirements of Living Things</strong></td>
</tr>
<tr>
<td>Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web.</td>
<td>Develop solutions to problems through reasoning, observation, and investigations.</td>
<td>Describe the basic requirements for all living things to maintain their existence.</td>
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<tr>
<td></td>
<td>Develop strategies and skills for information gathering and problem solving.</td>
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<tr>
<td></td>
<td>Construct charts and graphs and prepare summaries of observations.</td>
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<td></td>
<td>Explain how physical and behavioral characteristics of animals help them to survive in their environments.</td>
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<td></td>
<td>Describe positive and negative effects of humans on the environment.</td>
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</tbody>
</table>
Lesson 1: Characteristics and Functions of Observable Body Parts

I.1.E.1 Constructing New Scientific Knowledge
Generate questions about the world based on observation.
Key concepts: Questions lead to action, including careful observation and testing; questions often begin with “What happens if…?” or “How do these two things differ?”
Real-world contexts: Any in the sections on Using Scientific Knowledge

I.1.E.2 Constructing New Scientific Knowledge
Develop solutions to problems through reasoning, observation, and investigations.
Key concepts: (K-2) gather information, ask questions, think; (3-5) observe, predict, collect data, draw conclusions, conduct fair tests; prior knowledge
Real-world contexts: Any in the sections on Using Scientific Knowledge

I.1.E.6 Constructing New Scientific Knowledge
Construct charts and graphs and prepare summaries of observations.
Key Concepts: Increase, decrease, no change, bar graph, data table
Real-world contexts: Examples of bar charts like those found in a newspaper

II.1.E.1 Reflecting on Scientific Knowledge
Develop an awareness of the need for evidence in making decisions scientifically.
Key concepts: (K-2) observations; (3-5) data, evidence, sample, fact, opinion.
Real-world contexts: Deciding whether an explanation is supported by evidence in simple experiments, or relies on personal opinion.

III.2.E.1 Using Life Scientific Knowledge
Explain characteristics and functions of observable body parts in a variety of animals.
Key concepts: Observable characteristics – fur, scales, feathers, horns, claws, eyes, quills, beaks, teeth, skeleton, muscles, exoskeleton;

Vocabulary
observation
investigations
vertebrate
invertebrate
characteristic
scale
claw
quill
beak
insulation
function
skeleton
exoskeleton

Materials
- Student Journal Pages 1-3
- Transparency or chart of journal page 3
functions- insulation, support, movement, food-getting, protection
Real-world contexts: Vertebrate and invertebrate animals such as humans, cows, sparrows, goldfish, spiders, crayfish, insects

III.2.E.2 Using Life Science Knowledge

Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics.
Key concepts: Plant and animal parts – backbone, skin, shell, limbs, roots, leaves, stems, flowers, feathers, scales
Real-world contexts: Animals that look similar – snakes, worms, millipedes; flowering and nonflowering plants; pine tree, oak tree, rose, algae

LESSON

Students will carefully observe the body parts of a pictured animal (salamander). They will summarize information from the text and organize it into a chart. Using this information, they will evaluate the claims made by the students in the text and use their data from the chart as evidence to decide on the identification and classification of the animal.

KEY QUESTIONS

What animal did the students find under their tent? How do you know?

PROCEDURE

1. Read the first two paragraphs on student page one to set the stage for reading.
2. Students read the text with a partner or in a small group, depending on the needs of the readers.
3. Students go back and read the text again, filling in the chart on page three.
4. Using evidence from the text, students identify the animal that the children in the text found under their tent.
5. Review the characteristics of reptiles and amphibians from the students’ charts.

RESOURCES:


Mrs. Jones’ class went camping. The students saw an animal under their tent that looked like the one in Figure 1. Jessie saw the long, wet, slender body and first thought it was a big worm. Then he saw it had a head with two big eyes. He knew that worms do not have eyes. He changed his mind and decided it must be some kind of snake. Looking at it closely Rachel saw that it had two front legs and two hind legs. She thought it was a lizard. Sam said that maybe it was a salamander.

What kind of animal did these students find under their tent? Was it a snake, lizard, or salamander? Read about reptiles and amphibians below. Use the text and fill in the chart on page three to help you compare the differences between them.

Reptiles

Snakes, lizards, turtles, and alligators are reptiles. The skin of a reptile is covered with hard scales that overlap. The scales keep the skin from drying out. All reptiles reproduce by laying eggs. The eggs are usually buried in the ground. The eggs have a tough shell that keeps them from drying out, too. The reptiles that have feet have claws on them. The claws help them climb, run, and dig on land.

There are many more reptiles than mammals in the world. There are about 4,000 species of mammals. There are about 6,500 species of reptiles! Most reptiles are carnivores. They eat insects, rodents, fish, and other reptiles and amphibians. However, most turtles are omnivores. They eat both plants and animals. Birds and mammals eat reptiles.
Amphibians

Frogs, toads, salamanders, and newts are amphibians. There are nearly 6,000 species of amphibians in the world today. All amphibians have moist skin and no claws. Some have smooth skin. Others are warty. Amphibians use their skin to breathe and take in oxygen. They have glands that make mucus to keep their skin from drying out.

The young of most amphibians begin as larvae in the water. They hatch from tiny unshelled eggs. After hatching, they breathe through gills, just like fish. As they grow, they develop lungs. Many amphibians live on land as adults. A small number of frogs and salamanders are born on land. Some salamanders live only in the water and some are born and live only on land.

If you have ever seen a salamander on land or in the water, you may have thought it looked like a lizard. They do look alike, but the two groups are very different. Salamanders have moist, smooth skin. Lizards have dry scaly skin. Salamanders lay eggs without shells in the water. Lizards lay eggs with shells on the land. Reptiles and amphibians both have a backbone and are cold-blooded. A cold-blooded animal is one that does not produce enough body heat to keep a constant body temperature.

What kind of animal did the students see under their tent?  ________________

Give evidence to support your answer. Use information from the text.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
<table>
<thead>
<tr>
<th>Characteristics of Reptiles and Amphibians</th>
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<tbody>
<tr>
<td><strong>Reptiles</strong></td>
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<tr>
<td><strong>Backbone</strong></td>
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<tr>
<td><strong>Skin</strong></td>
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<tr>
<td><strong>Eggs</strong></td>
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<tr>
<td><strong>Feet</strong></td>
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<tr>
<td><strong>Young</strong></td>
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<tr>
<td><strong>How does it breathe?</strong></td>
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<tr>
<td><strong>Where does it live?</strong></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
</tr>
</tbody>
</table>
Lesson 2: Animal Life Cycles

III.2.E.3 Using Life Science Knowledge
Describe life cycles of familiar organisms.
*Key concepts:* Life cycle stages – egg, young, adult; plant, flower, fruit; larva, pupa
*Real-world contexts:* Common plants and animals such as bean plants, apple trees, butterflies, grasshoppers, frogs, birds

III.2.E.2 Using Life Science Knowledge
Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics.
*Key concepts:* Plant and animal parts – backbone, skin, shell, limbs, roots, leaves, stems, flowers, feathers, scales
*Real-world contexts:* Animals that look similar – snakes, worms, millipedes; flowering and nonflowering plants; pine tree, oak tree, rose, algae

LESSON
In this lesson, the students read about the life cycles of frogs, grasshoppers, and the Monarch butterfly. They research the life cycle of two other organisms then draw and describe them in their student journal.

KEY QUESTIONS
How do frogs, grasshoppers, and butterflies change as they become adults?
How do the life cycles of two other animals compare?

PROCEDURE
1. Ask the students the first key question.
2. Ask students to read about the life cycles of the frog, grasshopper, and butterfly. They can read individually or in pairs, depending on their reading abilities.
3. Have students choose another animal to research and complete page 6.
4. Have students share the information about their chosen animal. Discuss the similarities and differences.

Vocabulary
egg
young
adult
larva
pupa
backbone
skin
shell
limbs
scales

Materials

- Student Journal Pages 4-6
- Other resource to learn about the life cycle of two other animals (text book, trade book, Internet)
Animal Life Cycles

Many young animals look much like their parents. Others do not, but in each stage of growth they become more like their parents.

The Life Cycle of a Frog

Look at the pictures and notice how the frog changes in each stage of growth.

The frogs’ eggs are laid in water. The eggs have a jellylike covering and look like a mass of jelly in the water.

Young frogs hatch from the eggs. The young frogs are called larvae. They look like small fish. They are also called polliwogs or tadpoles. Like fish, tadpoles have tails and use gills to breathe air from the water in which they live.

Gradually back and front legs form. The tail disappears. Finally lungs form in the young frog. It can no longer breathe in water. It must breathe in the air.

The frog is then an adult. The adult female can lay eggs and the life cycle continues.

The Life Cycle of a Grasshopper

The grasshopper has three stages of growth — egg, nymph, and adult. After hatching, the young insect is called a nymph. A nymph is like a tiny adult, but it does not have wings. As it grows, it sheds its skin several times. At each shedding of the skin, the nymph enters a new "instar", a new stage of growth. The nymph becomes an adult insect when it has wings and can fly. The adult female grasshopper can lay eggs and the cycle begins again.
The Life Cycle of a Monarch Butterfly

Adult female monarchs lay their **eggs** on the underside of milkweed leaves. These eggs hatch, depending on temperature, in three to twelve days.

Caterpillars hatch from the eggs. Caterpillars are also called **larvae**. They feed on the milkweed leaves for about two weeks. They grow to be about 2 inches long.

After awhile, the caterpillars attach themselves head down to a nearby twig. They shed their outer skin and change into a **pupa** (or chrysalis). This process takes only a couple of hours. The pupa looks like a waxy, green vase. It later becomes more transparent.

The caterpillar completes the transformation into a beautiful **adult** butterfly in about two weeks. The butterfly finally comes out from the chrysalis. It waits until its wings stiffen and dry before it flies away to start the cycle of life all over again.

Learn about the life cycle of another animal. You may want to research the life cycle of a beetle, fly, mosquito, bird, praying mantis, or any other animal that interests you. On the next page draw a picture of their life cycle. Describe it on the lines below the pictures.
The Life Cycle of a ____________

[Diagram of a life cycle with arrows and boxes]

________________________
________________________
________________________
________________________
**Lesson 3: Plant Life Cycles**

### III.2.E.3 Using Life Science Knowledge
Describe life cycles of familiar organisms.

**Key concepts:** Life cycle stages – egg, young, adult; plant, flower, fruit; larva, pupa

**Real-world contexts:** Common plants and animals such as bean plants, apple trees, butterflies, grasshoppers, frogs, birds

### III.2.E.4 Using Life Science Knowledge
Compare and contrast food, energy, and environmental needs of selected organisms.

**Key concepts:** Life requirements – food, air, water, minerals, sunlight, space, habitat

**Real-world contexts:** Germinating seeds, such as beans, corn; aquarium or terrarium life such as guppy, goldfish, snail

### III.2.E.5 Using Life Science Knowledge
Explain functions of selected seed plant parts.

**Key concepts:** Plant parts – roots, stems, leaves, flowers, fruits, seeds

**Real-world contexts:** Common edible plant parts such as bean, cauliflower, carrot, apple, tomato, and spinach

### LESSON
Students will learn about plant parts and will be able to identify the different parts, the function of each part, and how they contribute to the survival of the plant. Students need to understand that plants make their own food. In our everyday language, we talk about giving our plants plant “food” to grow. Plant “food” or fertilizer that we add to the soil contains the minerals which plants use to make their food.

### KEY QUESTIONS
How do plants grow?
What do plants need to help them grow?
How do the parts of the plant help?

### PROCEDURE PART 1 (OPTIONAL, IF TIME)
**Time Period:** 1 class period for preparation of Bean Seed. About 6 days of observation for each of the 6 days.

### Vocabulary
- roots
- stem
- leaves
- flower
- fruit
- seed
- food
- air
- minerals
- sunlight
- habitat

### Materials
- Student Journal Pages 7-8
- 4 pinto or lima beans per group
- Another bean seed that was soaked in water overnight for each student
- paper towel
- masking tape
- one clear plastic cup
- grease pencil
- Internet
- Homework for next lesson – Student page 9
1. Give each student a bean seed that was soaked overnight in water to soften.
2. Have students look at and identify the parts of a seed: the seed coat, the stored food for the seed, and the embryo. This is the little plant that will grow if the conditions are good. Seeds need moisture and warmth in order to germinate.
3. Place a paper towel around the inside of the clear plastic cup.
4. Wad up moist paper towel and place it inside of the empty cup.
5. Place the four beans around the inside of the cup so that they are visible for observation. They should be placed between the paper towel and the inside of the plastic cup.
6. Keep the paper towel moist throughout the experiment.
7. Have students keep written and drawn observations for each day.

PROCEDURE PART 2
1. Students describe the function of each plant part. They may work together to complete this page.
2. Students identify the plant part from the riddles on page 8.
3. Students go back and revise their answers on page 7.
4. Discuss these as a whole group.
5. Show one of the videos from United Streaming if an additional review is needed.

HOMEWORK FOR THE NEXT LESSON

INTERNET RESOURCES:
The Great Plant Escape: http://www.urbanext.uiuc.edu/gpe/case1/index.html
Case 1 of this interactive web site has four parts. The first part does not cover any of the elementary benchmarks for plants, but it is a short section. The second part reviews the plant parts. The third part reviews the functions of the parts and the fourth part reviews the needs of growing plants.
Students identify the parts of a plant that can be eaten while they make a salad on this interactive web site.
The Life Cycle of a Pea Plant

1) flower   2) seed      3) leaves & stem          4) fruit   5) roots

Describe how the part of the plant in the picture helps the plant during its life cycle.

1. ________________________ ______________________________________________________________________________

2. ______________________________________________________________________________________________________

3. ________________________ ______________________________________________________________________________

4. ______________________________________________________________________________________________________

5. ______________________________________________________________________________________________________

Write the number of the picture on these lines to show the correct sequence in the life cycle.   _____,  _____,  _____,  _____,  _____

The plant grows **flowers**, which will make seeds for a new plant.

The **seed** is the beginning of a new plant. There is food stored in the plant that it will need until it can make its own food.

The **leaves** are now making food for the plant. The **stem** is holding up the plant.

The pea pods are the **fruit** of the plant. Inside the fruit are the seeds.

The roots are taking in water and minerals.
# Functions of Flowering Plant Parts

Read the description for each of the plant parts. Place the name of the plant part in the box below the description.

Which plant part am I?

<table>
<thead>
<tr>
<th>Description</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>I hold the leaves up so they can take in sunshine.</td>
<td>stem</td>
</tr>
<tr>
<td>I am like a highway for water and nutrients to travel up from the roots and for food to travel to the rest of the plant.</td>
<td></td>
</tr>
<tr>
<td>I take in water and minerals from the soil.</td>
<td>roots</td>
</tr>
<tr>
<td>I anchor or hold the plant in place.</td>
<td></td>
</tr>
<tr>
<td>Sometimes I store food for the plant.</td>
<td></td>
</tr>
<tr>
<td>My job is to make the seeds.</td>
<td>flower</td>
</tr>
<tr>
<td>I attract animals that will help to pollinate me by my color and smell.</td>
<td></td>
</tr>
<tr>
<td>I am the beginning for a new plant</td>
<td>seed</td>
</tr>
<tr>
<td>I store food for the new plant before it can make its own.</td>
<td></td>
</tr>
<tr>
<td>I do these important things for the plant.</td>
<td>leaves</td>
</tr>
<tr>
<td>• make food</td>
<td></td>
</tr>
<tr>
<td>• absorb sunlight</td>
<td></td>
</tr>
<tr>
<td>• take in carbon dioxide from the air</td>
<td></td>
</tr>
<tr>
<td>• give off oxygen and water vapor</td>
<td></td>
</tr>
<tr>
<td>I contain the seeds for new plants.</td>
<td>fruit</td>
</tr>
<tr>
<td>I protect the seeds until they can find the right conditions to grow.</td>
<td></td>
</tr>
</tbody>
</table>
Lesson Focus

- Using Life Science Knowledge
- Constructing New Scientific Knowledge

_Heredity_

Lesson 4: Heredity

I.1.E.5 Constructing New Scientific Knowledge

Develop strategies and skills for information gathering and problem solving. 

*Tools:* Sources of information, such as reference books, trade books, magazines, web sites, other people’s knowledge.

*Real-world contexts:* Seeking help from or interviewing peers, adults, experts; using libraries, World Wide Web, CD-ROMs and other computer software, other resources.

I.1.E.6 Constructing New Scientific Knowledge

Construct charts and graphs and prepare summaries of observations.

*Key Concepts:* Increase, decrease, no change, bar graph, data table

*Real-world contexts:* Examples of bar charts like those found in a newspaper

III. 3.E.1 Using Life Science Knowledge (Heredity)

Give evidence that characteristics are passed from parents to young.

*Key concepts:* Characteristics—hair and feather color, eye color, leaf shape, flower structure.

*Real-world contexts:* Example of mature and immature organisms, such as dogs/puppies, cats/kittens, maple trees/saplings, beans/seedlings.

LESSON

In part one, the students will take a survey on inherited traits home to complete with their parents. The students will create a data table and bar graph with the information from their survey and summarize their findings. In part two, the students play a game of chance to see which characteristics a baby might inherit from its parents.

KEY QUESTIONS

What physical traits are passed from mature to immature organisms?

What physical traits did you inherit from your parents?

PROCEDURE

1. Students need to complete the survey of inherited characteristics at home before this lesson. Be sensitive to students whose parents are deceased or if the student is adopted. Adjust this part of the assignment for the individual, according to the situation.

2. As a class, record the results of the survey in Table 1.

3. Teacher will model the correct way to create the bar graph (title, appropriate labels for the x-axis, appropriate scale and label for the

Vocabulary

inherit
characteristics
mature
immature

Materials

- Take home survey of inherited traits completed from homework assigned the previous day (page 9)
- Student Journal pages 10-12
- Colored pencils
- Transparency of Table 1 on student page 10
- Transparency of student page 11
- Coin to flip
y-axis) using the entire groups’ data for eye color. One bar represents the number of students with the same eye color as the mother, one bar representing the number of students with the same eye color as the father, and the third bar representing neither.

4. Teacher will assign groups of six. Each person in the group will be responsible to create a bar graph for one of the other inherited characteristics. While students are working, they will be able to see the differences among the graphs.

5. When students are finished, discuss the results and compare the graphs.

6. Questions for discussion:
   a. What are the similarities and differences between the graphs?
   b. Why do you think we have so many similar traits?
   c. Do you think it is the same for animals?

PROCEDURE PART 2

1. Tell students that not all characteristics are inherited.
2. List some of the characteristics that are not determined by their genes on the board. (For example, dyed hair, scars, broken bones, pierced ears, shaved heads, and missing tonsils or appendix).
3. Give the students the “Who Do I Look Like?” page 12 to complete. This can be done at home if necessary.
HOMEWORK
Inherited Characteristics Survey

1. What color are your eyes? ______________________________
2. What color are your mother/father’s eyes? __________________
3. What color is your hair? ________________________________
4. What natural color is your mother/father’s hair? ______________
5. Is your hair curly or straight? ______________________________
6. Is your mother/father’s hair curly or straight? ________________
7. Can you roll your tongue? ________________________________
8. Can your mother/father roll their tongue? _________________
9. Are your ear lobes attached or detached? _________________
10. Are your mother/father’s ear lobes attached or detached? __________
11. Do you have dimples? ________________________________
12. Does your mother/father have dimples? ________________
13. Are you right-handed or left-handed? __________________
14. Is your mother/father right-handed or left-handed? ___________

For each characteristic, put a check in the column to show whether you may have inherited that trait from your mother or your father. If neither parent has the same trait as you, make a mark in the last column.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mother</th>
<th>Father</th>
<th>Neither</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye color</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair color</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curly or Straight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolled Tongue</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ear Lobes</td>
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<tr>
<td>Dimples</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Right or left-handed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Gather data from other students in the class. Write the number of students who have their mother’s or father’s characteristics for each trait in the table below.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mother</th>
<th>Father</th>
<th>Neither</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye color</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair color</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Curly or Straight</td>
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<tr>
<td>Rolled Tongue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ear Lobes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right or left-handed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Make a bar graph of the data in Table 1.

<table>
<thead>
<tr>
<th>Parent</th>
<th>Mother</th>
<th>Father</th>
<th>Neither</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye Color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Who Do I Look Like?

On each side of the picture frame are characteristics of a Mom and a Dad. Your job is to determine what the baby will look like.

For each characteristic, flip a coin to determine which trait the baby gets. If you flip heads, the baby gets Mom’s trait; if you flip tails, the baby gets Dad’s trait. The baby should only have characteristics that are determined by genes. (Remember, not every characteristic is determined by genes.)

Mom

- Blue eyes
- Brown hair dyed black
- Curly hair
- Dimples
- Large eyebrows
- Skinny legs, cast on one
- No freckles
- Long eyelashes
- Scar on chin

Dad

- Brown eyes
- Red hair shaved off
- Straight hair
- No dimples
- Small eyebrows
- Thick legs, tattoo on one
- Freckles
- Short eyelashes
- Scar on forehead

Draw a picture of what you think the baby could look like.
Lesson 5: Fossils

III.4.E.1 Using Life Science Knowledge
Explain how fossils provide evidence about the nature of ancient life.
Key concepts: Types of evidence – fossil, extinct, ancient, modern life forms
Real-world contexts: Common contexts – plant and animal fossils, museum dioramas and paintings/drawings of ancient life and/or habitats

V. 1. E. 4 Using Earth Science Knowledge
Explain how rocks and fossils are used to understand the history of the earth.
Key concepts: Fossils, extinct plants and animals, ages of fossils, rock layers
Real-world contexts: Fossils found in gravel, mines, quarries, beaches (Petoskey stones), museum displays; Michigan examples of layered rocks; specific examples of extinct plants and animals, such as dinosaurs.

LESSON
The processes by which evidence of past life is preserved in fossils are explored in this lesson. Students begin the lesson by listing the characteristics of a horse. Then they think about which characteristics can be determined if only fossils of the horse’s bone and teeth remain. Students also participate in the simulation of the sedimentary process. The concept that fossils are remains or traces of ancient living things is reviewed. Students should begin to think about how rare of an event fossilization is.

DISCUSSION
Fossilization is a rare event. The chances of a given individual being preserved in the fossil record are very small. Some organisms, however, have better chances than others because of the composition of their skeletons or where they lived. This also applies to the various parts of organisms. For example, plants and vertebrates (animals with bones) are made up of different parts that can separate after death. The different parts can be transported by currents to different locations and be preserved separately. A fossil toe bone might be found at one place and a fossil rib at another location. We could assume that they are from different animals when, in fact, they came from the same one.
Much information is lost in the fossilization process. Think, for example, of a vertebrate (such as ourselves). Much of what we consider important about our own biology is in the soft tissues such as skin, hair, and internal organs. These characteristics would usually be unknown as a fossil because most of the time only bones and teeth are preserved (there are exceptional cases where soft parts are preserved). Bones and teeth are not always preserved together. This exercise is designed to get children to think about the quality of information that comes from the fossil record.

This lesson is adapted from Brent H. Breithaupt's Fossilization and Adaptation Page found at: http://www.ucmp.berkeley.edu/fosrec/Breithaupt2.html#FIG3

**KEY QUESTIONS**

What do we know about fossilized animals?
How does a living thing become a fossil?

**PROCEDURE**

1. List facts about characteristics of a living animal. (The skeleton of a horse is used here, but there are many other possibilities - e.g., cow, dog, cat, sheep). The list of facts for horse might include, but not be limited to: large size, fast runner, eats grass, has grinding teeth, has long hair for a mane and tail, whinnies, is intelligent, is sociable with other horses, makes a good pet.

2. What would we know if this animal was extinct? Point out an important generalization of fossilization: most of the time, only the hard parts (bones and teeth) are preserved as fossils. Go through the list and ask the class what we would know about the horse if horses were extinct and all we had were fossilized bones and teeth of horses. We would know that it was a large animal and could probably make some good guesses about its weight. We would know that it had grinding teeth and therefore could probably guess that it ate some sort of tough vegetation like grass. The hooves would not be preserved, but the shape of the foot bones would be a good indicator that it had hooves. The skeleton would also be useful to tell us that it was a fast runner. But no details of the hair or skin would be known. Everything about social behavior and vocalization would also have to be guesses.

3. Read student page 14 with the class or in pairs. Discuss.

**PROCEDURE FOR FOSSILIZATION GAME**

1. The game begins with the class or smaller group choosing an environment in which there is a depositional setting such as a lake, pond, stream, river in a forest, or sea floor. The students can use their imaginations to describe this setting in as much detail as they desire.

2. Choose roles. Roles that the participants choose for themselves are possible animal or plant inhabitants of the chosen setting. For example, in the aquatic settings, possible roles include not only snails, clams, fish, salamanders, turtles, alligators, and other aquatic animals, but also horses, deer, monkeys, rabbits, and birds that came there to drink.

3. Begin play. When play begins, the children act out their roles, with each one given a turn to make vocalizations or gestures. For example, a child playing a fish could wiggle his/her body with a fishlike motion and make gulping motions with his/her mouth. A child playing a prairie dog might pretend to dig a burrow and make high-pitched barks. They can also interact with each other as they would in their natural environment. For example, the carnivores could chase the herbivores.
4. "Freeze" and decide the fate of the characters. At a time determined by the teacher, action "freezes" and the time for possible fossilization begins. The students draw cards which tell their fate. Possible cards might be: -You are eaten by scavengers; -You rot away before you can be preserved; -You are swallowed by a crocodile; -You are buried by a mudslide and preserved as a fossil. You can make several copies of the page of cards (included with this activity) to use in this. If you make your own, the proportion of "fossilization" cards to "destruction" cards should be small, mimicking the small chance of becoming fossilized in the real world.

5. Discuss the meaning of this exercise. When the entire class has drawn cards, discussion can begin. Have each student discuss his or her role as an organism and what happened to this organism after it died. Make a list of these organisms on the blackboard. Which animals became fossils? Which were destroyed? Remember, the only animals and plants future paleontologists will know anything about are the ones that become fossils. You will become aware of the important question of bias in the fossil record when you compare the list of fossils with the complete list of living animals. Is the list of fossils a good representation of the living community? Why not?

6. If time allows, play the game again with the same animals and plants. How are the results similar or different?

RESOURCES
Schools with the fourth grade McGraw Hill Science 2002 edition may want to follow up with reading pages C 16-23
## Fossilization Cards

<table>
<thead>
<tr>
<th>DRY UP</th>
<th>DRY UP</th>
<th>ROT AWAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROT AWAY</td>
<td>ROT AWAY</td>
<td>SWALLOWED BY ALLIGATOR</td>
</tr>
<tr>
<td>SWALLOWED BY CROCODILE</td>
<td>SWALLOWED BY CROCODILE</td>
<td>SWALLOWED BY BIG FISH</td>
</tr>
<tr>
<td>SWALLOWED BY BIG FISH</td>
<td>Eaten by scavengers</td>
<td>Eaten by scavengers</td>
</tr>
<tr>
<td>BURIED IN SOFT MUD – YOU BECOME A FOSSIL!</td>
<td>BURIED IN MUDSLIDE - YOU BECOME A FOSSIL!</td>
<td>WASHED AWAY BY WAVES</td>
</tr>
<tr>
<td>WASHED AWAY BY WAVES</td>
<td>WASHED AWAY BY CURRENT</td>
<td>WASHED AWAY BY CURRENT</td>
</tr>
</tbody>
</table>
Fossils

List the characteristics of a living horse.

<table>
<thead>
<tr>
<th>Hair color</th>
<th>Sounds it makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye color</td>
<td>What it eats</td>
</tr>
<tr>
<td>Make a good pet</td>
<td>How fast it runs</td>
</tr>
<tr>
<td>Height</td>
<td>Weight</td>
</tr>
<tr>
<td>How long its hair is</td>
<td>It has hooves</td>
</tr>
</tbody>
</table>

Fossils are evidence of animals that were once living. What would we know about horses if all horses were extinct? Go back to your list and cross out the things you would not know about the animal if all you had were fossils of its bones and teeth.

Explain what we can know about extinct animals from studying their fossils.

- We could tell how big it was from the kind and the size of its bones. We could tell if it was a fast runner from studying its leg bones. We could guess what it ate from its teeth. We would not be able to know its skin or hair color. We would not be able to know what sounds it made or how it acted.
Fossils and How They Are Made

The chance of a plant or animal being preserved as fossil is very small. However, some organisms have better chances than others because of the kind of skeleton they have or because of where they lived. Animals with shells, bones, and teeth have a better chance of becoming a fossil. Organisms that live in a lake, pond, stream, river in the forest, or on the sea floor also have a better chance of becoming a fossil.

It may not be possible to know some details of what an ancient animal or plant was like because many parts of its body may not become fossils. Usually fossils show the hard parts of the animal such as shells, teeth, or bones. This is because the soft parts are destroyed quickly after death. Sometimes you will find the actual shells.

Plants and animals are made up of different parts. The parts can separate after death. The different parts can be transported by currents to different locations and be preserved separately. A fossil toe bone might be found at one place and a fossil rib at another location.

Most fossils are actually casts of animals or plants. Here's how an animal fossil might be made:

- The animal dies and sinks to the sea floor.
- The body begins to decay and is buried under layers of sediment such as mud or sand.
- These layers become rock.
- The hard parts of the animal are replaced with minerals such as iron pyrites or silica.
- These minerals form the fossil.

Sometimes you find trace fossils. Trace fossils are not of the animals themselves but of evidence of living plants or animals, such as worm burrows or dinosaur footprints. Most fossils are found in sedimentary rocks - rocks which were created when shells or small loose bits of rock are laid down in layers. Examples of sedimentary rocks are limestone, sandstone, clay and chalk.
III. 4.E.1 Using Life Science Knowledge

Explain how physical and behavioral characteristics of animals help them to survive in their environments. 

**Key concepts:** Characteristics – adaptation, instinct, learning, habit; Traits and their adaptive values – sharp teeth or claws for catching or killing prey, color for camouflage, behaviors 

**Real world contexts:** Common vertebrate adaptations, such as white polar bears, sharp claws and sharp canines for predators, changing colors of chameleon; behaviors, such as migration, communication of danger.

**LESSON**

Students will read informational text about the praying mantis. As they read it, they will organize the physical and behavioral characteristics in a chart, identify which kind of characteristic it is, and describe how it helps the animal survive.

**KEY QUESTION**

What are the behavioral and physical characteristics of the praying mantis? How do these characteristics help it survive in its environment?

**PROCEDURE**

1. Assign students to small groups or pairs, depending on the ability of the student, to read the text.
2. Discuss the difference between physical (what the animal looks like) and behavioral (how the animal behaves) characteristics.
3. Review vocabulary that may be challenging – antennae, camouflage, nymph, praying mantis
4. Tell students first to read through the text one time.
5. Students go back and list five characteristics of the praying mantis.
6. Students decide if it is a physical or behavioral.
7. Students explain how the characteristic helps the animal survive.
8. Discuss ideas written with the whole class.
All animals are adapted to help them survive in their environment. What an animal looks like is a physical characteristic. How the animal acts is a behavioral characteristic. As you read this selection the first time, look for the characteristics of a Praying Mantis. Then go back and read it again. Look for the characteristics and list them on the chart on the next page. Decide if the characteristic is physical or behavioral. As you read, think about how each characteristic helps the animal survive.

Let’s Focus On the... Praying Mantis
Adapted from the 2002 Tracks Magazine™, produced by the Michigan United Conservation Clubs, mucc.org

Have you ever seen a long, narrow, grasshopper-like insect that looked like its front legs were raised in prayer? If so, you’ve probably seen a praying mantis. The Chinese praying mantis is the most common kind found in North America. It is usually about four inches long, but it can grow as large as six inches. The Chinese praying mantis is grass-green, with a long, thin body. It has a tiny, heart-shaped head with two very large, dark eyes.

All mantises can turn their heads 180 degrees. Most insects cannot turn their head at all! This allows the mantis to follow moving prey without moving the rest of its body. This helps the mantis located prey without letting the prey know it is there.

Two long, narrow antennae (an-TEN-ee) stick out from a mantis’s forehead. These are used to smell and feel. Mantises have six legs and four wings. Mantises can range in size from ½ inch to over 6 inches.

The front legs, which it uses like our arms, are very strong, and they are lined with rows of sharp spines. The spines help hold prey in place. Mantises can even hold prey in one leg while catching another insect with their other leg! Mantises do not bite humans. But if you pick one up, the sharp spines on their front legs may feel like a sharp pinch on your hand.

Mantises are often camouflaged to suit the area in which they live. For example, the flower mantis is pink and white and lives in the tropical rainforest. It feeds in flowering trees. The praying mantis is a fierce hunter. Mantises are carnivores, or meat-eaters. They may eat other insects, small frogs and birds, and even their mates! They hunt
with great patience and stay very still for a long time. Then they quickly seize dinner between their powerful front legs. They eat their prey live, biting the neck first to paralyze it.

In the autumn, female mantises lay from 30 to 300 eggs in a large mass or cluster about an inch long. The female secretes a frothy, gummy substance to lay the eggs in so they will stick to tree twigs or plant stems. This protects the eggs from the wind, rain and snow and helps hide them from predators. The eggs spend the winter inside the cluster. Tiny nymphs emerge from the egg case in the spring or early summer.

The praying mantis is a friend to man because it eats many insects that feed on our crops. Farmers use the praying mantis as a means of natural pest control. They order mantis egg cases from suppliers and place them in their fields to hatch. Some of the favorite foods of the mantis are flies and mosquitoes. You may want to see if you could get a praying mantis to hang out near your house!

The following are examples of correct responses.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Is it physical or behavioral?</th>
<th>Explain how it helps the Praying Mantis survive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color (green, or pink and white)</td>
<td>Physical</td>
<td>Camouflage – the animal cannot be seen by other animals that would eat it (predators); It also helps it hide from the animals it is trying to eat (its prey)</td>
</tr>
<tr>
<td>Antennae</td>
<td>Physical</td>
<td>It helps the animal smell its food and feel where it is</td>
</tr>
<tr>
<td>Long thin body shape</td>
<td>Physical</td>
<td>It helps the mantis hide from its predators and prey</td>
</tr>
<tr>
<td>Secretes gummy substance on egg case</td>
<td>Behavioral</td>
<td>Protects the eggs from weather and predators until they are ready to hatch</td>
</tr>
<tr>
<td>Spines on strong front legs</td>
<td>Physical</td>
<td>Helps to hold its prey</td>
</tr>
<tr>
<td>Stays very still while hunting</td>
<td>Behavioral</td>
<td>Helps it catch its prey. Its prey will not realize it is there</td>
</tr>
<tr>
<td>Turns head 180°</td>
<td>Behavioral</td>
<td>The turning of the head is a behavioral characteristic that allows its body to remain still while it looks for its prey</td>
</tr>
<tr>
<td>The female lays 30-300 legs</td>
<td>Behavioral</td>
<td>Many eggs needed for successful reproduction; not all eggs will live to be adults</td>
</tr>
<tr>
<td>Eats many insects - flies and mosquitoes</td>
<td>Behavioral</td>
<td>Eating helps the animal get energy and nourishment</td>
</tr>
</tbody>
</table>

SP 16
Lesson Focus

- Using Life Science Knowledge

Ecosystems

Lesson 7: Food Chains and Food Webs

III.5.E.1 Using Life Science Knowledge

Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web.

*Key concepts*: Producer, consumer, predator, prey, decomposer, habitat, community.

*Real-world contexts*: Food chains and food webs involving organisms, such as rabbits, birds, snakes, grasshoppers, plants.

LESSON

In this lesson students will construct a food web as a team. They will review the key vocabulary terms related to the food web by filling in a chart that identifies the role of several common organisms.

KEY QUESTIONS

How can I construct a food web?

How can I describe the feeding relationships in a food chain and food web?

PROCEDURE

1. Watch the video from United Streaming, if available. If not, review the vocabulary.
2. Divide the class into 2 teams. One student from each team will be the scorekeeper.
3. The teacher will begin by putting the picture of grass onto the board.
4. A member of the first team will begin by taping a picture of a plant eater (herbivore) on the board and link it to the grass (producer) with a piece of yarn.
5. A member of the second team will either a) add to the chain by linking a meat eater (carnivore) or an omnivore to the first team’s herbivore, or b) start another food chain by linking a second herbivore to the plant, or c) start a different food chain with another kind of plant.
6. Team members continue taking turns. If the link is correct, the scorekeeper will record a point.

Vocabulary

- producer
- consumer
- decomposer
- predator
- prey
- habitat
- community

Materials

- Student Journal Page 17
- Set of food chain cards on Teacher pages 38-41. (Attach magnetic strips if you have a magnetic blackboard)
- Yarn
- Tape
7. When the game is finished, ask the following questions:
   a. Which organisms are producers?
   b. Which organisms are consumers?
   c. Why does the food chain begin with a producer?
   d. What would happen if all of the producers were removed from the food chain?
   e. What would happen if one of the other organisms were removed?

8. Have students identify the relationships of the organisms listed on the journal page by checking the boxes in the columns that describes the organism’s role.

RESOURCES
   Food Chain Mystery, The (15:00)
   Introduction (00:01)
   Energy in Habitats (02:45)
   Plants (01:05)
   Animals (00:40)
   Producers and Consumers (01:18)
   Herbivores, Carnivores, and Omnivores (00:59)
   Decomposers (00:56)
   More Food Chains (00:52)
   Energy Pyramid and Food Web (01:44)
   Review (01:12)
   Conclusion (01:05)

The following websites have food chain activities:

Fun With Food Chains (Harcourt School)
http://www.harcourtschool.com/activity/food/food_menu.html

http://www.bbc.co.uk/schools/revisewise/science/living/
Revise Wise Science from the United Kingdom
bear

Blue Jay

butterfly

cat

chipmunks

deer
<table>
<thead>
<tr>
<th>eagle</th>
<th>fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>fox</td>
<td>grasshopper</td>
</tr>
<tr>
<td>beetle</td>
<td>mouse</td>
</tr>
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<tr>
<td><strong>owl</strong></td>
<td><strong>rabbit</strong></td>
</tr>
<tr>
<td><strong>snail</strong></td>
<td><strong>earthworms</strong></td>
</tr>
<tr>
<td><strong>frog</strong></td>
<td><strong>raccoons</strong></td>
</tr>
</tbody>
</table>
leaves and twigs | nuts
---|---
seeds | fruits and berries
grass | grain
Food Chains

Make a food chain. Draw a picture of the plant or animal in the boxes. You do not need to use all the boxes and you may draw more if you need them. Write the word producer or consumer in the space above the plant or animal. Write the words producer, predator, and/or prey in the space below the box. Draw arrows to show the flow of the energy through the food chain.

At this level, the animal may be an omnivore. This animal is both predator and prey if the fourth box is used.
Lesson 8: Virtual Peppered Moths

I.1.E.2 Constructing New Scientific Knowledge
Develop solutions to problems through reasoning, observation, and investigations.
*Key concepts:* (K-2) gather information, ask questions, think; (3-5) observe, predict, collect data, draw conclusions, conduct fair tests; prior knowledge
*Real-world contexts:* Any in the sections on Using Scientific Knowledge

I.1.E.5 Constructing New Scientific Knowledge
Develop strategies and skills for information gathering and problem solving.
*Tools:* Sources of information, such as reference books, trade books, magazines, web sites, other people’s knowledge
*Real-world contexts:* Seeking help from or interviewing peers, adults, experts; using libraries, World Wide Web, CD-ROMs and other computer software, other resources

I.1.E.6 Constructing New Scientific Knowledge
Construct charts and graphs and prepare summaries of observations.
*Key Concepts:* Increase, decrease, no change, bar graph, data table
*Real-world contexts:* Examples of bar charts like those found in a newspaper

III. 4.E.2 Using Life Science Knowledge
Explain how physical and behavioral characteristics of animals help them to survive in their environments.
*Key concepts:* Characteristics—adaptation, instinct, learning, habit. Traits and their adaptive values—sharp teeth or claws for catching and killing prey, color for camouflage, behaviors
*Real-world contexts:* Common vertebrate adaptations, such as white polar bears, sharp claws and sharp canines for predators, changing colors of chameleon; behaviors, such as migration, communication of danger

Vocabulary
adaptation
instinct
learning
habit
camouflage

Materials
- Student Journal pages 18-23
- Stop watch or clock with a second hand
- Class Data Sheet on Overhead or Chart Paper, (Journal page 21)
- Markers or colored pencils
- Optional: Copy of data from Teacher Toolbox page 51 if computers and the Internet are not available
III. 5.E.4 Using Life Science Knowledge

Describe positive and negative effects of humans on the environment.

Key concepts: Human effects on the environment—garbage, habitat destruction, land management, renewable and non-renewable resources

Real-world contexts: Household wastes, school wastes, waste water treatment, habitat destruction due to community growth, reforestation projects, establishing parks or other green spaces, recycling

LESSON

In this lesson, students will engage in scientific inquiry as they play a simulation on the Internet. The simulation is that of a Blue Jay eating dark and light colored moths on lichen covered trees (light background) and soot-covered trees (dark background). This simulation is found online at http://www6.district125.k12.il.us/~nfischer/Moth/default.htm. They will record the percentage of moths remaining in the environment after 1 minute. They will organize and graph the data, then draw a conclusion. The data gathering part of the activity can be done very quickly if a computer lab is available. The teacher who did this activity with her class reported that it took about 20 minutes for the students to practice the game, do the simulation, gather the data, report it, and record it on the class data sheet. Alternatively, in a one or two computer classroom, students can gather the data during a specified time during day, taking turns on the computer and recording results on a class-recording sheet. If computers are not available, data are available from this teacher’s class to graph and analyze.

The lesson is designed to take two days. On the first day, read about the Peppered Moth; gather the data and start to analyze it. Some students will be ready to graph. Finish the graphing on the second day and draw a conclusion. The short assessment can be given at the end of the second day. Students should reread the story of the peppered moth before completing the assessment.

KEY QUESTION

In what ways are living things adapted (suited) to survive in their environments?
How does an animal’s camouflage affect its survival?
How do communities of living things change over a period of time?
How do community growth and pollution affect a moth?

PROCEDURE

1. Find out how much the students already know by discussing the key questions. They can fill in the research section of the lab report with the information that was discussed. After the discussion explain to the students that they will be playing a virtual game in the computer lab.
2. Read The Story of the Peppered Moth.
3. Students will need to access the following web page: http://www6.district125.k12.il.us/~nfischer/Moth/default.htm. This web page address is listed on the data sheet of the lab report so students will have it with them at the computer.
4. Start by letting the students try each version of the game and practice pausing the game for collection of data.
5. Explain that students will be timed for one minute. At the end of one minute you will be collecting the data for the classroom on a large chart and the students will collect data on their individual student charts.
6. Have the students play the lichen covered forest version and collect data. Have them record their observations.
7. Have the students play the dark soot, covered forest version and collect data. Have them record their observations.
8. Summarize the data chart by adding the columns of data, dividing it by the number of students (the mean or average) and discuss the results.
9. Students set-up a graph and record the information from the total columns of the data chart onto the graph.
10. Finish lab report by filling in the conclusion section of the lab report
11. Answer discussion questions with the class

**DISCUSSION QUESTIONS**
1. What was the original environment for the peppered moth?
2. Which moth was eaten at that time? Why?
3. What was the peppered moth’s environment like after human interaction?
4. Which moth was now being eaten? Why?
5. How is Human interaction now affecting the peppered moth?

**VARIATION:**
If a computer lab is not available, students can play the simulation and collect data individually and record data on a group recording sheet. These data then can be copied and used for graphing and analyzing.

**RESOURCES**

http://www6.district125.k12.il.us/~nfischer/Moth/default.htm
Virtual Peppered Moth Game

http://www.enchantedlearning.com/subjects/butterfly/glossary/pepperedmoth.shtml
Teacher Resource for Peppered Moths

Scholastic’s Dirtmeister Animal Adaptations.
http://teacher.scholastic.com/dirtrep/animal/invest.htm

http://www.uen.org/utahlink/activities/view_activity.cgi?activity_id=4750
Descriptions of a variety of animal adaptations.

http://www.uga.edu/srel/kidsdoscience/kidsdoscience-predator-game.htm
Predator Prey Game. A Power Point presentation about Predator Prey is also found at this web site on the following page http://www.uga.edu/srel/kidsdoscience/predator-prey/predator-prey_files/frame.htm

Gila Monster Adaptations

http://widgeon.com/Wilson/Grade4/SelectedAnimals.html
Links for individual animals (worksheets and research information) and their adaptations. Although adaptation is not always specifically mentioned.

Fourth Grade Web quest with animal adaptations

http://www.enchantedlearning.com/coloring/camouflage.shtml
Good one for camouflage and animal adaptations.

http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm
Food chain game

http://www.uga.edu/srel/kidsdoscience/kidsdoscience-predator-game.htm
In this game students assume the role of “predator” and must locate appropriate prey items that have been placed throughout the room.
In the early 1800’s there were many light colored peppered moths in England. They liked to rest on the trunks of birch trees. Birch tree trunks are light colored too. The light colored peppered moth was hard for predators to see on the trunks of birch trees. This is called camouflage. The color and marks on the peppered moths helped them survive in their environment.

During the Industrial Revolution, coal was burned in the factories. The burning coal made black soot. The soot covered living and non-living things nearby. The soot covered the birch trees where the light colored peppered moths rested during the day. This changed the environment of the peppered moths. The light colored peppered moths were easier to see on the dark, soot covered birch tree.

In 1848, a dark-colored peppered moth was first seen in the area. The dark-colored moths were hard for birds to see on the dark colored trees. Birds ate the light colored moths that were easier to find. They did not eat as many dark colored moths. By 1895, there were few light-colored moths left. Now most of the peppered moths in the area near the factories were the dark-colored moths.

Humans changed the environment. The burning of coal in the factories affected the peppered moth. But humans made other changes too. They made new laws to help keep the air clean. Today, with the clean air laws, cleaner fuels are burned in factories. The soot is gone and there are more light-colored moths. But now the scientists worry that the dark-colored moths may become extinct.
Virtual Peppered Moths Investigation Report

Questions:

- What characteristics do peppered moths have to help them survive in their environment?
- What happens to the population of moths when their environment changes?

Research: (Here are some things I already know about the question.)

Hypothesis: This is what I think will happen and why I think that)

Procedure:

1. Go to [http://www6.district125.k12.il.us/~nfischer/Moth/default.htm](http://www6.district125.k12.il.us/~nfischer/Moth/default.htm)
2. Play the game for lichen-covered trees for one minute and record results.
3. Play the game for the soot-covered trees for one minute and record results.
4. Gather class data and record on class data sheet.
5. Find the mean for each moth in both environments.
6. Graph results.
My Results:

<table>
<thead>
<tr>
<th>Lichen-covered Environment</th>
<th>Soot-covered Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Moth Population</td>
<td>Light Moth Population</td>
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<td>Light Moth Population</td>
<td>Dark Moth Population</td>
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<td>Light Moth Population</td>
<td>Light Moth Population</td>
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</tbody>
</table>

Class Results:

<table>
<thead>
<tr>
<th></th>
<th>Lichen Covered Trees</th>
<th>Soot Covered Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Moth</td>
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<td></td>
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<tr>
<td>Light Moth</td>
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</tbody>
</table>

Share your results with the class and copy on the Class Data Sheet. Find the average or mean for each moth in each environment. Fill in this chart with the averages or mean from the Class Data Sheet. Graph the class results.

Conclusion:

Answer the research questions. Use evidence from the results of your investigation.

- What characteristics do peppered moths have to help them survive in their environment?
- What happens to the population of moths when their environment changes?

*Peppered moths are speckled with colors that match their environment. This makes them difficult for their predators (the Blue Jay) to find them. When the environment changed, the light colored moths were easier to see and the Blue Jays ate more of them. In the game, 72% of the light colored moths survived on the lichen covered trees because they were harder to see. 75% of the dark colored moths survived when the trees were covered with soot.*
# Class Data Sheet

<table>
<thead>
<tr>
<th>Students</th>
<th>Lichen-covered Environment</th>
<th>Soot-covered Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dark Moth Population</td>
<td>Light Moth Population</td>
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<td>Dark Moth Population</td>
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<td>30</td>
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<tr>
<td>Mean</td>
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</tr>
</tbody>
</table>
Construct a graph to show your results. Choose a scale, give your graph a title, and include labels. Make a key if necessary.
# Class Data Sheet

Use these data if you cannot play the game on the computer.

<table>
<thead>
<tr>
<th>Student</th>
<th>Lichen-Covered Environment</th>
<th>Soot-covered Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dark Moth Population</td>
<td>Light Moth Population</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>75</td>
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<tr>
<td>2</td>
<td>18</td>
<td>82</td>
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<td>3</td>
<td>23</td>
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<td>4</td>
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<td>28</td>
<td>15</td>
<td>85</td>
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<tr>
<td>29</td>
<td>28</td>
<td>72</td>
</tr>
</tbody>
</table>

Mean
Answers: Your class results could be similar. These are the data and the graph if you use the data from Teacher Page 51 instead of your own students’ data.

<table>
<thead>
<tr>
<th></th>
<th>Lichen Covered Trees</th>
<th>Soot Covered Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Moth</td>
<td>28</td>
<td>75</td>
</tr>
<tr>
<td>Light Moth</td>
<td>72</td>
<td>25</td>
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</tbody>
</table>

Here is an example of a graph students might make. They may also choose two separate graphs, one for each environment.
Use The Story of the Peppered Moth to answer the following questions:

1. Which word best describes the moth’s role in this story?
   - A. Camouflage  
   - B. Predator  
   - C. Prey  
   - D. Extinct  
   Answer: C.

2. What do scientists think happened to the light colored moths in the middle and late 1800’s?
   - A. They were able to hide on the trunk of birch trees  
   - B. Birds ate most of them  
   - C. They became extinct.  
   - D. They were not able to see their food in the dark.  
   Answer: B.

3. What was NOT the reason for the increase in the number of dark-colored moths?
   - A. The soot from the factories made the bark of the birch trees dark.  
   - B. The dark colored moths were camouflaged on the soot-covered bark of the birch trees.  
   - C. It was difficult for birds to see the dark-colored moths.  
   - D. The dark colored moths had plenty of food.  
   Answer: B.

4. Why might the dark-colored moth become extinct?
   - A. Soot does not cover the bark of the birch trees.  
   - B. The dark-colored moth cannot find enough food.  
   - C. The light-colored moth is eating the dark colored-moth.  
   - D. The birds like to eat the dark-colored moth more than the light-colored moth.  
   Answer: A.

5. Constructed Response

Describe a positive and negative effect humans had on the environment in this story.

*Humans polluted the air and the environment with the soot from burning coal in the factories. This hurt the population of light colored moths. Humans made laws and cleaned the air. This helped the population of the light colored moths.*
Lesson 9: Michigan Ecosystem Rummy

III. 5.E.2 Using Life Science Knowledge
Describe the basic requirements for all living things to maintain their existence.

Key concepts: Needs of life—food, habitat, water, shelter, air, light, minerals
Real-world contexts: Selected ecosystems, such as an aquarium, rotting log, terrarium, backyard, local pond or wetland, wood lot

LESSON
In this final life science lesson, students review the needs of living organisms and learn about the animals from Michigan by playing the Michigan Ecosystem Rummy game.

PROCEDURE
1. Start by discussing the food chain and the food web. Choose an animal and brainstorm with the students what that animal required to survive in their ecosystem. Repeat this with a second and possibly third animal.
2. Once a list is made ask the students if there are any similarities among the three lists. Ideally this result in the six items needed for survival - Habitat, Food, Water, Sunlight, Minerals, and Air.
3. Explain to them that they will be playing a form of Rummy in which the object of the game is to obtain the cards for an ideal ecosystem. To make this game more manageable, the students will not need a card for sunlight and minerals.
4. Read the Rummy Rules from the student journal pages 24-25.
5. Each student may use his or her copy of the Michigan Ecosystem Rummy Guide while playing the game. This guide is on Journal page 26.

RESOURCES
For information about an Alvar and other natural communities in Michigan, see http://www.michigan.gov/dnr/0,1607,7-153-10370_22664-60281--,00.html
Rummy Rules

Introduction
Ecosystem Rummy is played by four players each receiving five cards.

The Deck
The deck consists of forty cards. These cards are divided into the environmental needs plus the animals: animal, food, water, minerals, and habitat. To make this game more manageable, air was not included as an environmental need. Discuss this when explaining the game.

The Deal
The first dealer is chosen randomly, and the turn to deal alternates between the players. Each player is dealt five cards, one at a time. The remaining cards are placed face down in the center of the table and the top card is turned face up to start the discard pile. The players look at and sort their cards.

Object of the Game
The object of the game is to arrange as many as possible of the five cards in your hand into sets. A set includes an animal and what it needs from its environment - food, water, minerals, and habitat.

Play
A normal turn consists of two parts:

The Draw
You must begin by taking one card from either the top of the stockpile or the top card on the discard pile, and adding it to your hand. The discard pile is face up, so you can see in advance what you are getting. The stock is face down, so if you choose to draw from the stock you do not see the card until after you have committed yourself to take it. If you draw from the stock, you add the card to your hand without showing it to the other players.
**The Discard**

To complete your turn, one card must be discarded from your hand and placed on top of the discard pile face up. If you took the top card from the discard pile, you must discard a different card - taking the top discard and putting the same card back is not permitted.

For the first turn of the hand, the draw is done in a special way. First, the person who did not deal chooses whether to take the turned up card. If the non-dealer declines it, the dealer may take the card. If both players refuse the turned-up card, the non-dealer draws the top card from the stockpile. Whichever player took a card completes their turn by discarding and then it is the other player's turn to play.

**Winning**

A player wins when they have made the ideal environment for their animal. They may lay down their winning hand before the turn moves onto the next player.

For Example:

This player has the Bald Eagle (Animal), Water, Wetlands: Pond, Minerals, and Fish (Food). They have a winning hand.
<table>
<thead>
<tr>
<th>ANIMAL</th>
<th>HABITAT</th>
<th>FOOD</th>
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<tbody>
<tr>
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<td>Red Fox (Omnivore)</td>
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<td>White Tailed Deer</td>
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<td>(Herbivore)</td>
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<td>Grasses</td>
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<td>Wild Turkey (Omnivore)</td>
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<td>Oak Savanna</td>
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<td>Badger (Carnivore)</td>
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<td>Carrion</td>
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</table>
adaptation - changes in an organism that enable it to adjust to life in a new environment
adult - a full grown mature organism
air - a colorless, odorless, tasteless, gaseous mixture, mainly nitrogen (approximately 78 percent) and oxygen (approximately 21 percent) with lesser amounts of argon, carbon dioxide, hydrogen, neon, helium, and other gases.
ancient – of great age, very old
backbone - the vertebrate spine or spinal column
beak – 1) the horny, projecting structure forming the jaws of a bird, especially one that is strong, sharp, and useful in striking and tearing; a bill; 2) a similar structure in other animals, such as turtles, insects, or fish.
camouflage - to hide by protective coloring or body shape that blends in with the surrounding environment
characteristic- a feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
claw - a sharp, curved, horny structure at the end of a toe of a mammal, reptile, or bird
community- a group of plants and animals living and interacting with one another in a specific region under relatively similar environmental conditions
consumer- any organism that eats the food producers make
decomposer- An organism that breaks down wastes and remains of other organisms.
egg- the female sex cell.
evidence - thing or things helpful in forming a conclusion or judgment
exoskeleton- a hard covering that protects an invertebrate’s body.
extinct- said of an organism no longer alive on earth.
flower - reproductive organ of plants especially one having showy or colorful parts
fossil- any evidence of an organism that lived in the past.
fruit- the ripened ovary of a flowering seed plant
function - activity of an organ or body part
habit – a recurring often unconscious pattern of behavior that is acquired through frequent repetition
habitat- the home of an organism
immature - not fully grown or developed
inherit - to receive (a characteristic) from one’s parents by genetic transmission
instinct- an inborn pattern of behavior that is characteristic of a species and is often a response to specific environmental stimuli
insulation- 1) A material that reduces or prevents the transmission of heat or sound or electricity 2) the act of protecting something by surrounding it with material that reduces or prevents the transmission of sound or heat or electricity
invertebrate- An animal without a backbone
investigation - A detailed inquiry or systematic examination
larva- A worm-like stage of some organisms that hatches from an egg during complete metamorphosis; a young organism with a form different from its parents
leaves- Any plant parts, usually green, that use sunlight to make food
light - Electromagnetic radiation that has a wavelength in the range from about 4,000 (violet) to about 7,700 (red) angstroms and may be perceived by the normal unaided human eye
limbs- 1) One of the larger branches of a tree. 2) One of the jointed appendages of an animal, such as an arm, leg, wing, or flipper, used for locomotion or grasping
mature - Having reached full natural growth or development
minerals- A naturally occurring substance, neither a plant nor animal
modern - Characteristic or expressive of recent times or the present; contemporary or up-to-date
observation - The act of noting and recording something
predator - An animal that hunts other animals for food
prey - A living thing that is hunted for food
producer - An organism such as a plant that makes food
pupa - A stage of some organisms that follows the larva stage; many changes take place as adult tissues and organs form
quill - Any of the larger wing or tail feathers of a bird
roots - The part of a tree that takes in water and other materials a plant needs to make food
scale - one of the many small plate-like structures that characteristically form the external covering of fishes, reptiles, and certain mammals
seed - An undeveloped plant with stored food sealed in a protective covering
shell - The usually hard outer covering that encases certain organisms, such as mollusks, insects, and turtles
shelter - Something that provides cover or protection, as from the weather
skeleton - The internal structure composed of bone and cartilage that protects and supports the soft organs, tissues, and other parts of a vertebrate organism; endoskeleton
skin - The membranous tissue forming the external covering or integument of an animal and consisting in vertebrates of the epidermis and dermis
stem- The part of a tree that carries food, water and other materials to and from the roots and leaves
sunlight - The light of the sun; sunshine
vertebrate- An animal with a backbone
young - Being in an early period of life, development, or growth