unit 17

Structure, Function and Survival
What do organisms need in their habitat to survive, and how can their adaptations help them survive in their habitat?

How does an organism’s structure help it survive?

What roles do external structures play in an animal’s survival?

What roles do internal structures play in an animal’s survival?

What roles do internal structures play in an animal’s behavior?

How do animals’ senses help them to survive?

How does light help us see?

What are the different ways that animals use their senses and structures to help them receive and respond to information from the environment?

How can we compare the way very different creatures take in information from their environment?
<table>
<thead>
<tr>
<th>Lesson</th>
<th>Inside MySci kit, you’ll find:</th>
<th>Items you must supply:</th>
<th>Extra prep time needed:</th>
</tr>
</thead>
</table>
| Lesson 1 | Class set of pictures of different animals in different habitats *Tree of Life*, by Barbara Bash | Science notebooks  
Chart paper or whiteboard  
Internet access | Review *MySci Safety Guidelines*  
Copy and administer the pre-assessment |
| Lesson 2 | Animal classification cards  
Animal adaptation cards  
2 bags of 15 plastic animals each  
Animal Classes DVD  
*What do you do with a tail like this?* by Steven Jenkins | Science notebooks  
Chart paper or whiteboard  
Internet access  
Scissors | Classifying Birds activity worksheets (Appendix i-ii)  
Copies of Animal Adaptations Worksheet (Appendix iii),  
Answer Key (Appendix iv) |
| Lesson 3 | Animal skeleton cards  
Animal cards from Lesson 2  
DK Human Body Book | Science notebooks  
Internet access | Copies of Human Skeleton chart (Appendix v)  
Copies of Comparing Animal Skeleton worksheet (Appendix vi and vii) |
| Lesson 4 | Pictures of animals from Lesson 1 | Science notebooks  
Chart paper  
Internet access | Copies of Internal/External Clues Sheet (Appendix viii) |
| Lesson 5 | *Amazing Animal Senses!* By Caroline Hutchinson  
Animal pictures from Lesson 1  
10 vials with scented cotton balls (2 each of 5 scents) | Chart Paper  
Science notebooks  
Internet access | Put one of each of the scent vial around the room. Divide the class into 5 groups. Give each group one scent vial and ask them to find the matching vial.  
Copies of the Comic Strip Checklist (Appendix ix) |
| Lesson 6 | 6 mystery boxes  
6 small red plastic tomatoes  
6 flashlights  
Batteries | Chart Paper  
Science notebooks  
Internet access | Fold up the mystery boxes ahead of time and put a tomato in each one. |
| Lesson 7 | | | Copies of the project instructions and rubric, (Appendices x, xi, and xii)  
Copy and administer post-assessment |
What do organisms need in their habitat to survive, and how can their adaptations help them survive in their habitat?

Lesson 1: What are components of a habitat that animals need in order to survive?

LEARNING TARGET
Identify parts of a habitat required for organism survival.
Explain how animals and plants can adapt to different types of habitats.

SUMMARY
Students hear the story of Tree of Life, explore animals in different habitats through photos and discussion and review what is in a habitat.

ENGAGE
Read Tree of Life.
Ask the class: What are the different stages of the baobab tree? How did the different animals use the baobab tree? What kind of environment supports the baobab tree?
Make a chart of the characteristics of the savannah habitat: hot, dry, etc, for use in the next activity. Ask: Could the tree live anywhere else? Why or why not?
Show Video Baobab Tree http://www.youtube.com/watch?v=HgT98VK6mZk

EXPLORE
Pass out the pictures of animals in different habitats. In pair-share groups, have the students identify the animal, if possible. If the habitat in the picture is not clear, have students predict where this animal would survive best given its characteristics. Have them discuss the habitat their animal is pictured. How does it compare with the baobab tree? Make a Venn Diagram of the components from their pictures on the chart paper.

EXPLAIN
Ask the students to identify, and explain to their neighbor why the picture shows a healthy habitat. Can they find evidence of the right temperatures, clean water, food sources, and places to raise their young? Ask the students to explain how a habitat connects to an animal’s physical characteristics (their adaptations).

More information: Habitats (Animal Atlas)
(Note: This is a long video, about 22 minutes. However, you can choose to stop it after about 4:35 or choose other segments to watch). https://www.youtube.com/watch?v=7Klscf43X4w

MYSCI MATERIALS:
Class set of pictures of different animals in different habitats
Tree of Life, by Barbara Bash

TEACHER PROVIDES:
Chart paper
Science notebooks
Internet access

Teaching Tip:
This icon highlights an opportunity to check for understanding through a formal or informal assessment.

Teaching Tip:
One circle of the Venn Diagram should be labeled Baobab Tree, the other with the habitat from one of the animals they chose from the cards. For example, if they chose a fish, the other circle would be labeled River or Ocean. Then the pairs would write which components are in each or both of the habitats. The components they should use are air, water, food, shelter and space. The students should use specifics, like plants for food for fish, or leaves for the Baobab tree.
Lesson 1 continued: What are components of a habitat that animals need in order to survive?

ELABORATE

☑️ Tell the class: So far we have talked about how animals need certain habitat requirements, and how they can adapt to live in a particular environment. What about plants? How do plants adapt to their environment? Have the students write their ideas in their science notebooks.

Show You At The Zoo - Plant Adaptations https://www.youtube.com/watch?v=fVfV5LMXh2s

EVALUATE

☑️ In their science notebook, the students should write a story (about the animal they chose from the cards) in which the animal has to adapt to a new situation. Look for lack of water, air, food, space or shelter as a reason the animal must adapt. Have them make the diagram in their science notebook.

Teaching Tip:

Students should think about how different plants obtain and store water, protect themselves from being eaten, and spread their seeds (i.e. cactus needles, root storage, thorns, winged seeds, and fleshy fruit).
Lesson 2: What roles do external structures play in an animal’s growth and survival?

**LEARNING TARGET**
Identify and classify external structures of animals and plants.
Describe how external structures help the organism survive in a particular environment.

**SUMMARY**
Students explore physical and behavioral characteristics of animals through video, books, websites and picture cards.

**ENGAGE**
*Activity:* Divide the class in half. Pass out an animal to each student. Ask them to observe each animal carefully. Ask them what group their animal might belong to. Give each half of the class time to work on observing and grouping their animals. Show the students the classification cards. Go over each card. Ask: Are there any changes you want to make with your animals? Then watch the Animal Classes DVD.

**EXPLORE**
Ask the class: What do you notice about the animals? How do their external structures vary? How do the external structures of the animals help the animals survive? On the board, write the word camouflage. Ask: Who knows what that means? How do animals use that adaptation to survive?
Camouflage is the “art of concealment or hiding.” It involves disguising an object, in plain sight, in order to hide it from something or someone. Animals use color and pattern to blend in with their habitat so that they’re almost invisible. They can also use a combination of color, shape, and behavior to help them appear like something in their habitat. They are simply mistaken for something else. Some animals have special markings that help to disguise their shapes.
Ask: What are some examples of animals that use camouflage? Discuss the concept of adaptations — anything an animal has or does to help them survive in their habitat. Explain that there are two different kinds of adaptations. Draw a T-chart on a piece of chart paper. On one side write has, and on other write does. Explain that anything an animal is born with in or on its body is a physical characteristic. Animals have no choice about their physical characteristics just like kids have no choice about having a stomach and thumbs.
Ask: What are examples of things a wolf is born with in or on its body? Write those things in the has column. Now explain that anything an animal does
Lesson 2 continued: What roles do external structures play on an animal’s growth and survival?

is called a behavioral characteristic. These are actions animals choose to do, like running or flying.

EXPLAIN
Read the book What Do You Do With A Tail Like This? to the class. As you read, keep a list on the board of the external structures in the book (nose, ears, tail, etc).

Ask the class: How are the external structures of animals different from each other? (Use the plastic animals.) Tell students to compare their animal to their partner’s animal using the external structures list from the book. What other external structures can they compare?

ELABORATE
Activity 1: Adaptation and Survival
Show adaptation cards. Hold up one at a time and ask: What other adaptation besides camouflage do you see? Examples are: beaks, claws, shells, big eyes. Then ask these questions: What do hibernation, migration or being nocturnal have to do with survival? Which of the plastic animals do one of the above? How could you find out?

Here are some animal adaptation videos to show in class:
Animal Adaptations https://www.youtube.com/watch?v=fRX2JtKFUzk
25 Animals With Insane Survival Adaptations https://www.youtube.com/watch?v=wNqiclBUxdY

Here are some plant adaptation videos to show:

Activity 2: Classifying Birds Based on External Features (Appendix i and ii)
In this activity, students will work in small groups to create their own classification system for birds based on their physical characteristics. The students should cut out the bird cards (Appendix i) and group the birds on their desks based on the characteristics they choose, such as beak shape, claw shape, or feather pattern. At this point, there is no right or wrong answer, but the teacher should ask the students to justify their choices and think about why each bird has its own unique characteristics. Then, they will use a dichotomous key to classify different birds based on things like beak size/shape, neck size/shape, and feather characteristics. Emphasize to students that these physical characteristics are adaptations that help these birds survive in their particular habitat. You may want to ask students to place a novel bird, such as a bluebird, into their new classification system.

EVALUATE
Pass out and have students complete the Animal Adaptations worksheet (Appendix iii).

Teaching Tip:
The following are other great resources:
National Geographic Great Migrations
Knowledge Project Animal Migrations
http://www.nature.com/scitable/knowledge/library/animal-migration-13259533
Brainpop Educators Lesson Ideas
http://www.brainpop.com/educators/community/bp-jr-topic/hibernation/
Lesson 3: What roles do internal structures play in an animal’s survival?

LEARNING TARGETS
Compare an organ system among animal groups and explain how these internal structures help them survive.

SUMMARY
Students match skeletons to the corresponding animal.

ENGAGE
Tell the class: So far we have looked at external structures of animals. Today we are going to focus on the internal structures. Does anyone know what internal systems mammals have that help us survive? (If no one mentions hearts, lungs, etc., show several different pages from DK Human Body book. Read the page 13 about the skeletal system.)

Ask: Which of the animals we have looked at so far have skeletons? What do skeletons do for an animal to help it survive? Have students draw a picture in their science notebooks of what they think the animal skeleton looks like.

EXPLORE
In this lesson we are going to focus on the skeletal system.

Activity: Pass out the Animal Skeleton cards to 16 students. Have the students with the “outside cards” describe their animal without naming it, for example, “It has a long neck, four legs, etc.” When a student who has an “inside card” that they think matches, they can go to the student and check for accuracy.

EXPLAIN
Ask the class: What does our skeleton look like? Have students draw in their science notebooks what they think the human skeleton looks like. Then pass out the Human Skeleton chart (Appendix v), and have them compare.

ELABORATE
Show animal adaptation cards from Lesson 2. Ask: Do each of these animals have a skeleton? (They all do except for the snail. Animals without bones are called invertebrates. There are many invertebrates in the world, for example, insects, jellyfish, snails, worms, crabs, octopus, and starfish.) For more information on vertebrates vs. invertebrates, visit the following video slideshow links from Scholastic:

http://studyjams.scholastic.com/studyjams/jams/science/animals/vertebrates.htm
http://studyjams.scholastic.com/studyjams/jams/science/animals/invertebrates.htm

EVALUATE
Use Comparing Animal Skeleton worksheet (Appendix vi-vii).
Ask students to answer the following prompt in their science notebooks: What adaptations do animals without skeletons (invertebrates) have to help them survive? Answers could include exoskeletons or shells.

MYSCI MATERIALS:
Animal Skeleton cards
Animal Adaptation cards from lesson 2
DK Human Body book

TEACHER PROVIDES:
Science notebooks
Internet access
Copies of the Human Skeleton chart (Appendix v)
Copies of the Comparing Animal Skeleton worksheet (Appendix vi-vii)

Teaching Tip:
If there are not enough Skeleton cards to go around, have the students work in pairs, alternating who gives a clue.

Teaching Tip:
For the Comparing Animal Skeletons worksheet, the answers for question 4 are: A–Cat; B–Horse; C–Otter; D–Rabbit
Lesson 4: What roles do internal structures play in an animal’s behavior?

LEARNING TARGET
Describe how a particular animal uses internal and external cues to survive.

SUMMARY
The students identify the behaviors that aid in animal survival.

ENGAGE
Ask the class: *What are some reasons why you might leave your classroom during a lesson?* (Examples: you need to use the restroom, a fire drill, get called down to the office, etc.) Write their reasons on a chart. Then go back and decide as a class if they are internal or external reasons.

EXPLORE
Pass out the Internal or External Cues? sheet (Appendix viii). Ask the class: *Which of these questions refer to internal cues and which refer to external cues?* Write the answer to the question after you determine if it is internal or external.

- **Students will complete a science notebook activity.** Answer the following questions and then come back as whole group to compare answers:
  - *Why do we eat?* (Internal)
  - *Why do we wear different clothes in different environments?* (External)
  - *Why do we drink?* (Internal)
  - *Why do certain animals hide during the day?* (External)
  - *Why do some only come out during the day?* (External)
  - *Why don’t we see some animals during the wintertime?* (External or Internal, like for migration if they get internal cues to move on)
  - *Why do some animals stay away from each other?* (External)
  - *Why do some animals make noises?* (Either; for example, some animals make noises to meet mates, which would be internal, and some noises might be external, like warning of a predator.)

EXPLAIN:
Go over the answers (listed above) as a class and discuss.

ELABORATE
Ask the class: *What internal or external cues allow an animal to know it is hungry, in danger and/or it time to move habitats?* On a chart paper, write internal and external in a T-chart. Have them identify the questions from “engage” in their science notebook as Internal Cues or External Cues. (For example; eating because we are hungry is an internal cue.)

EVALUATE
Students will write a story as if they are an animal and write about how they survive in his/her environment using their external and internal structures in their science notebooks. They could draw a picture story that follows their writing activity.
Lesson 5: How do animals’ senses help them to survive?

LEARNING TARGET
Create a model that describes how animals use their senses to respond to their environment.

SUMMARY
Students will explore their sense of smell and compare it with other animals and other senses.

ENGAGE
Ask the class: What can animals learn by using their senses? Have the students go back to their stories they wrote in the previous lesson. Did they include the sense of smell for survival? Have students share what they wrote. Then watch Animal Senses http://www.youtube.com/watch?v=h090r5C5fn0

EXPLORE
There are 10 vials for this lesson, 2 of each scent. Put one vial of each scent somewhere around the room. Divide the class into five groups. Give each group one vial that contains a scent. After they each smell it, ask each group to find a vial that matches the smell in their vial. Have each group try to find their matching scent. Then watch Smelling http://www.youtube.com/watch?v=9qdor5V0SDk

EXPLAIN
Ask the class: What internal or external structure do animals use to receive information from their sense of touch, sight, smell, or hearing?

Using the cards from Lesson 1, have the students identify the structures that receive information from touch, sight, smell and hearing. Students will draw which structures animals used to receive information in their science notebooks. Watch Animal Senses http://www.youtube.com/watch?v=rb9CAliLgIA

ELABORATE
Before you read the book “Amazing Animal Senses” to the class, prompt students that what they will learn in the book will be useful in making a comic strip about animal senses.

EVALUATE
Ask the class: How do animals respond to the information received using their senses?

Students will create a 4 box comic strip illustrating an animal using its senses and how it responds to the information received in order to survive in its environment. Introduce and explain the Comic Strip Checklist (Appendix ix) and advise that the students will perform a gallery walk to examine each others’ comic strips.

MYSCI MATERIALS:
Amazing Animal Senses! By Caroline Hutchinson
Animal Pictures from Lesson 1
10 vials with scented cotton balls (2 each of 5 scents)

TEACHER PROVIDES:
Chart paper
Science notebooks
Internet access
Copies of the Comic Strip Checklist (Appendix ix)
Lesson 6: How does light help us see?

LEARNING TARGET
Create a model that describes the path of light from an object to the eye. Explain how the sense of sight has been adapted in response to different habitats.

SUMMARY
Students will explore their sense of sight.

ENGAGE
Pass out the Mystery Boxes to the groups of students. Ask them to look in and tell their neighbor what they see. Pass the box to each person in the group, and have them look inside. What did you see? Does everyone in the group agree?

EXPLORE
Tell students to talk with a partner, and discuss whether animals and people can see objects in total darkness. Why or why not?

Students will work with a partner discussing their thoughts/ideas and then as a whole group the class can vote “yes” or “no”, and then discuss why they think they are correct. Then have the students shine the flashlight in one hole in the box and look through the other hole to see inside the box. Now can they name what is in the box?

EXPLAIN
Watch Animal Science — Extreme Vision

Ask the class: Can an owl see in the dark? How can an owl hunt in total darkness? What else does it use? Answer these questions in your science notebook.

ELABORATE
Ask the class: What kinds of adaptations allow animals to adapt to conditions like these?
- Very bright light
- Very dim light or no light
- Seeing underwater
- Dirty or sandy conditions

EVALUATE
Explain the path of light from the flashlight to your eye from the Mystery Box experiment.

Students will draw a directional diagram that includes the flashlight, box, tomato and their eye. Students will write to explain their diagrams.

MYSCI MATERIALS:
6 Mystery boxes (make ahead of time)
6 flashlights
6 small red plastic tomatoes
Batteries

TEACHER PROVIDES:
Chart paper
Science notebooks
Computer with Internet access
Lesson 7: How can we compare the way very different creatures take in information from their environment?

Learning Target
Compare and contrast a structure across organisms.
Explain how the structure is adapted to help an animal survive.

Summary
Students will choose four animals and one sense or structure and do a research project to compare and contrast the sense or structure. Students will present their research in the format that you choose (Powerpoint, Prezi, Posterboard, paper, etc).

Hand out the Research Project Instructions and Rubric (in Appendix x-xii — can be double-sided). Explain to students that they must pick one of the structures or senses listed below and four animals.

Structures/Senses (Each student chooses 1)
- Eyes
- Ears
- Nose
- Mouth
- Limbs
- Tail
- Skin or Coat

Animals (Each student chooses 1 animal from each category)
- Mammal
- Bird
- Fish
- Reptile or Amphibian

For an added challenge, students can also choose an insect, arachnid, or invertebrate!

Teaching Tip:
Depending on your class structure, they can do research in class or outside of class. You may also wish to have a draft check-in date where you review their work or have students do peer reviewing.

Teacher Provides:
Copies of the Research Project Instructions and Rubric, Appendices x, xi, and xii)
Key to Understanding the NGSS Codes

**NGSS codes begin with the grade level, then the “Disciplinary Core Idea code”, then a standard number. The Disciplinary Core Ideas are:**

**Physical Sciences**  
PS1: Matter and its interactions  
PS2: Motion and stability: Forces and interactions  
PS3: Energy  
PS4: Waves and their applications in technologies for information transfer  

**Life Sciences**  
LS1: From molecules to organisms: Structures and processes  
LS2: Ecosystems: Interactions, energy, and dynamics  
LS3: Heredity: Inheritance and variation of traits  
LS4: Biological evolution: Unity and diversity  

**Earth and Space Sciences**  
ESS1: Earth’s place in the universe  
ESS2: Earth’s systems  
ESS3: Earth and human activity  

**Engineering, Technology, and Applications of Science**  
ETS1: Engineering design  
ETS2: Links among engineering, technology, science, and society  

*For more information, see WEB LINK*
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<tr>
<th>Concepts</th>
<th><strong>SCIENCE AND ENGINEERING PRACTICE</strong></th>
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<tbody>
<tr>
<td><strong>Asking Questions and Defining Problems</strong></td>
<td><strong>Constructing Explanations and Designing Solutions</strong></td>
</tr>
<tr>
<td>• Ask questions about what would happen if a variable is changed.</td>
<td>• Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).</td>
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<tr>
<td>• Identify scientific (testable) and non-scientific (non-testable) questions.</td>
<td>• Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.</td>
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<tr>
<td>• Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.</td>
<td>• Identify the evidence that supports particular points in an explanation.</td>
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<tr>
<td>• Use prior knowledge to describe problems that can be solved.</td>
<td><strong>Engaging in Argument from Evidence</strong></td>
</tr>
<tr>
<td>• Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.</td>
<td>• Compare and refine arguments based on an evaluation of the evidence presented.</td>
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<tr>
<td>• Identify limitations of models</td>
<td>• Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.</td>
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<tr>
<td>• Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.</td>
<td>• Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.</td>
</tr>
<tr>
<td>• Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.</td>
<td>• Construct and/or support an argument with evidence, data, and/or a model.</td>
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<tr>
<td>• Develop and/or use models to describe and/or predict phenomena.</td>
<td>• Use data to evaluate claims about cause and effect.</td>
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<tr>
<td>• Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.</td>
<td>• Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.</td>
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<tr>
<td>• Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.</td>
<td><strong>Obtaining, Evaluating and Communication Information</strong></td>
</tr>
<tr>
<td><strong>Analyzing and Interpreting Data</strong></td>
<td>• Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.</td>
</tr>
<tr>
<td>• Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.</td>
<td>• Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.</td>
</tr>
<tr>
<td>• Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.</td>
<td>• Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.</td>
</tr>
<tr>
<td>• Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.</td>
<td>• Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.</td>
</tr>
<tr>
<td>• Analyze data to refine a problem statement or the design of a proposed object, tool, or process.</td>
<td>• Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.</td>
</tr>
<tr>
<td>• Use data to evaluate and refine design solutions.</td>
<td><strong>Using Mathematics and Computational Thinking</strong></td>
</tr>
<tr>
<td><strong>Using Mathematics and Computational Thinking</strong></td>
<td>• Communicate scientific and/ or technical information orally and/or in written text.</td>
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<tr>
<td>• Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.</td>
<td>• Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.</td>
</tr>
<tr>
<td>• Organize simple data sets to reveal patterns that suggest relationships.</td>
<td><strong>CROSSCUTTING CONCEPTS</strong></td>
</tr>
<tr>
<td>• Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.</td>
<td><strong>Patterns</strong></td>
</tr>
<tr>
<td>• Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.</td>
<td>• Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.</td>
</tr>
<tr>
<td><strong>DISCIPLINARY CORE IDEAS</strong></td>
<td>• Patterns of change can be used to make predictions.</td>
</tr>
<tr>
<td><strong>LS4.C: Adaptation</strong></td>
<td>• Patterns can be used as evidence to support an explanation.</td>
</tr>
<tr>
<td>For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)</td>
<td><strong>Cause and Effect: Mechanism and Prediction</strong></td>
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<tr>
<td><strong>PS4.B: Electromagnetic Radiation</strong></td>
<td>• Cause and effect relationships are routinely identified, tested, and used to explain change.</td>
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<tr>
<td>An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)</td>
<td>• Events that occur together with regularity might or might not be a cause and effect relationship.</td>
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<tr>
<td><strong>LS1.A: Structure and Function</strong></td>
<td><strong>Systems and System Models</strong></td>
</tr>
<tr>
<td>Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)</td>
<td>• A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.</td>
</tr>
<tr>
<td><strong>LS1.D: Information Processing</strong></td>
<td>• A system can be described in terms of its components and their interactions.</td>
</tr>
<tr>
<td>Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)</td>
<td><strong>Structure and Function</strong></td>
</tr>
<tr>
<td><strong>Patterns</strong></td>
<td>• Different materials have different substructures, which can sometimes be observed.</td>
</tr>
<tr>
<td>• Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.</td>
<td>• Substructures have shapes and parts that serve functions.</td>
</tr>
</tbody>
</table>
Key to Understanding the GLE Codes

GLE codes are a mixture of numbers and letters, in this order: Strand, Big Idea, Concept, Grade Level and GLE Code.

The most important is the strand. The strands are:
1. ME: Properties and Principles of Matter and Energy
2. FM: Properties and Principles of Force and Motion
3. LO: Characteristics and Interactions of Living Organisms
4. EC: Changes in Ecosystems and Interactions of Organisms with their Environments
5. ES: Processes and Interactions of the Earth’s Systems (Geosphere, Atmosphere and Hydroshpere)
6. UN: Composition and Structure of the Universe and the Motion of the Objects Within It
7. IN: Scientific Inquiry
8. ST: Impact of Science, Technology and Human Activity

For more information see web link.
Classifying Birds

Section 2, Lesson 2

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds

Classifying Birds
Classifying Birds (continued)

Section 2, Lesson 2

**DIRECTIONS:**
1. Cut out the bird cards on the attached page.
2. Working with your group, sort the birds into categories on your desk or table. This is called a classification system.
3. Your classification system may be different than other groups. Compare your system to other groups.
4. Follow the steps below to identify the names of all of your birds. Write the names on the bird card cut-outs. These steps have a special name—“Dichotomous Key” (pronounced DIE-COT-UH-MUS).

Dichotomous keys can help scientists sort living things and classify newly discovered living things.

<table>
<thead>
<tr>
<th>STEP NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Long beak ... go to 2</td>
</tr>
<tr>
<td>1b</td>
<td>Short beak ... go to 3</td>
</tr>
<tr>
<td>2a</td>
<td>Long, curvy neck ... go to 4</td>
</tr>
<tr>
<td>2b</td>
<td>Short neck ... <strong>HUMMINGBIRD</strong></td>
</tr>
<tr>
<td>3a</td>
<td>Crested/crowned head ... go to 6</td>
</tr>
<tr>
<td>3b</td>
<td>Non-crested head ... go to 7</td>
</tr>
<tr>
<td>4a</td>
<td>Floppy skin flap under beak ... <strong>PELICAN</strong></td>
</tr>
<tr>
<td>4b</td>
<td>No skin flap under beak ... go to 5</td>
</tr>
<tr>
<td>5a</td>
<td>Thick, curved beak ... <strong>FLAMINGO</strong></td>
</tr>
<tr>
<td>5b</td>
<td>Thin, pointy beak ... <strong>CRANE</strong></td>
</tr>
<tr>
<td>6a</td>
<td>Long, flowing tail feathers ... <strong>PEACOCK</strong></td>
</tr>
<tr>
<td>6b</td>
<td>No long, flowing tail feathers ... go to 8</td>
</tr>
<tr>
<td>7a</td>
<td>Eyes to the side, unspotted feathers ... <strong>PARROT</strong></td>
</tr>
<tr>
<td>7b</td>
<td>Eyes to the front, spotted feathers ... <strong>HAWK</strong></td>
</tr>
<tr>
<td>8a</td>
<td>Black feathers around beak ... <strong>CARDINAL</strong></td>
</tr>
<tr>
<td>8b</td>
<td>Circle shape on cheek ... <strong>COCKATIEL</strong></td>
</tr>
</tbody>
</table>
Animal Adaptations Worksheet
Section 2, Lesson 2

Name: ________________________________ Date: ________________________

Fill in the blanks with words from the box:

adaptation, behavioral, camouflage

coloring, hibernation, resemblance

mimicry, migration, nocturnal

roots, stems, structural

Any body part or behavior that helps an animal survive in its environment is called an _________________.

There are two kinds of adaptations, structural and behavioral. ________________ adaptations are body parts such as claws, long necks, colored skin, and strong muscles. ________________ adaptations are behaviors such as living in groups and hunting in packs. Desert plants for example have thick ____________________________ to help store water and ____________________________ that spread out to gather what little rain falls. Desert animals are often ____________________________, which helps them avoid water loss from the day's heat. One important structural adaptation is ____________________________, which is any coloration or body shape that helps an animal blend in with its environment. Camouflage can be divided into two kinds, protective coloring and protective resemblance. Protective ____________________________ is when an animal skin or fur has colors that make it hard to see in its environment. Protective ____________________________ is when the animal’s body shape looks like something in its environment the way a walking stick insect looks like a twig. ____________________________ is another structural adaptation where an animal looks similar to another more dangerous animal, which helps to frighten predators away. Important behavioral adaptations include ____________________________ to avoid harsh weather conditions or to find safe breeding grounds and ____________________________ to conserve energy when food is scarce.
Any body part or behavior that helps an animal survive in its environment is called an adaptation.

There are two kinds of adaptations, structural and behavioral. Structural adaptations are body parts such as claws, long necks, colored skin, and strong muscles. Behavioral adaptations are behaviors such as living in groups and hunting in packs. Desert plants for example have thick roots to help store water and stems that spread out to gather what little rain falls. Desert animals are often nocturnal which helps them avoid water loss from the day’s heat. One important structural adaptation is camouflage, which is any coloration or body shape that helps an animal blend in with its environment. Camouflage can be divided into two kinds, protective coloring and protective resemblance.

Protective coloring is when an animal skin or fur has colors that make it hard to see in its environment. Protective mimicry is when the animal’s body shape looks like something in its environment the way a walking stick insect looks like a twig. Resemblance is another structural adaptation where an animal looks similar to another more dangerous animal, which helps to frighten predators away.

Important behavioral adaptations include migration to avoid harsh weather conditions or to find safe breeding grounds and hibernation to conserve energy when food is scarce.
Labeled Diagram of Human Skeleton

Section 2, Lesson 3

- cranium
- mandible
- clavicle
- sternalum
- ribs
- radius
- pelvis
- ulna
- metacarpals
- femur
- tibia
- tarsals
- phalanges
- patella
- fibula
- metatarsals
- scapula
- humerus
- vertebrae
- os coxae
- sacrum
- carpals
- coccyx
- phalanges

Illustration source: sketched by Abhishake Sharma
1. Look at the Human Skeleton as a reference for this activity. What are some ways you think the skeletons of humans are like those of animals?

2. What do you think some differences are?

3. Compare the human skeleton to the skeletons of the animals pictured below. What do you notice that all these animals have in common? (Backbone, four legs, etc.)
4. Can you figure out what animal skeletons are pictured? For each animal write what animal skeleton is pictured. List some clues that you used to come up with your answer.

Animal A: __________________________
Clues: __________________________

Animal B: __________________________
Clues: __________________________

Animal C: __________________________
Clues: __________________________

Animal D: __________________________
Clues: __________________________

5. Imagine that you are walking in the woods and you find a single animal bone. How would you decide which animal the bone came from? Use complete sentences to answer this question.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
DIRECTIONS
Write Internal or External, then answer the question.

1. Why do we eat?

2. Why do we wear different clothes in different environments?

3. Why do we drink?

4. Why do certain animals hide during the day?

5. Why do some only come out during the day?

6. Why don’t we see some animals during the wintertime?

7. Why do some animals stay away from each other?

8. Why do some animals make noises?
DIRECTIONS
Create a 4-block comic strip. Use this checklist to create your own comic strip. Be sure that your comic strip shows:

☐ Your animal
☐ The sense that the animal is using
☐ What the animal is reacting to
☐ How the animal reacts

1

2

3

4
Research Project Instructions

Section 3, Lesson 7

Name: ____________________________ Date: ________________

The structure or sense I chose: ________________________________________________________________

My mammal: ____________________________ My bird: ________________________________

My fish: ________________________________ My reptile or amphibian: ______________________

1. For each animal, show a picture of the animal in its habitat. Describe the animal and its habitat using 2 or 3 sentences.

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

2. For each animal, describe the sense or structure you chose. Be specific! Use pictures if they will help.

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________
3. How is the structure/sense adapted to help each animal survive in its habitat? (You can include things like how the structure or sense helps the animal find food, avoid predators, keep warm or cool, etc.)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. Compare the sense or structure for all of your animals. How are they the same?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

5. Contrast the sense or structure for all of your animals. How are they different?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

6. Where did you get your information? List the books, websites, or other resources that you used for your research.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
## Research Project Rubric

### Section 3, Lesson 7

<table>
<thead>
<tr>
<th></th>
<th>1 BEGINNING</th>
<th>2 APPROACHING</th>
<th>3 MEETING</th>
<th>4 SURPASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completeness</strong></td>
<td>More than one question is not answered are missing.</td>
<td>One question is not answered at all or several questions are incomplete</td>
<td>All questions are answered but 1 or 2 answers are not complete.</td>
<td>All questions are answered fully.</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>More than 4 inaccurate facts.</td>
<td>Three or four inaccurate facts.</td>
<td>One or two inaccurate facts.</td>
<td>All facts are accurate.</td>
</tr>
<tr>
<td><strong>Clarity</strong></td>
<td>The animals and structure/sense are not clear.</td>
<td>Most animals and the structure/sense are not clear.</td>
<td>Most animals and structure/sense are clear.</td>
<td>It is very clear which animals and structure/sense the student chose.</td>
</tr>
<tr>
<td><strong>Presentation/Graphics</strong></td>
<td>Graphics do not go with the text or appear random.</td>
<td>Some graphics do not go with the text.</td>
<td>The presentation has some graphics to enhance the text but might have too few or too many graphics.</td>
<td>The presentation has a good mix of text and graphics that enhance the text.</td>
</tr>
<tr>
<td><strong>Writing and Organization</strong></td>
<td>Many mistakes in grammar, spelling, capitalization, or punctuation.</td>
<td>Between 6 and 10 mistakes in grammar, spelling, capitalization, or punctuation.</td>
<td>Less than 5 mistakes in grammar, spelling, capitalization, or punctuation.</td>
<td>The written work is clear with few or no mistakes in grammar, spelling, capitalization, or punctuation.</td>
</tr>
</tbody>
</table>

| **My Score**              |                                                                               |                                                   |                                                   |                                                   |

**Teacher Feedback:**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Vocabulary Words
All Sections and Lessons

habitat  vertebrate
survival  invertebrate
ecosystem  skeleton
environment  exoskeleton
landforms  internal
temperature  external
adaptation  structure
behavior  function
camouflage  organ system
coloring  classification
hibernation  cue
resemblance  predator
mimicry  response
migration  sense
nocturnal  light
structural  dichotomous key
characteristics
physical
behavioral