SURVIVING IN YOUR ECOSYSTEM
## ASSOCIATION OF ZOOS & AQUARIUMS EDUCATION STATISTICS*

### CONSERVATION AND RESEARCH
- **700 species** benefiting from conservation action
- **375 species studied** through mission-based research

### EDUCATIONAL PROGRAMMING
- Supporting classroom-based learning
- **51 million elementary, middle and high school students** participated in education programs
- **91 MILLION participants** in programs that focus on actions to address conservation issues

### SUPPORTING STEM
- **STEM programming** reached **2.3 million participants**
- **Over 5 million** spent on STEM Education

*Details provided by the Association of Zoo and Aquariums 2015 highlights annual report.
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The Zoo in 3D, Professional Learning Summit

Teachers,

Thank you for joining us for The Zoo in 3D Professional Learning Summit!

Today’s program is the culminating event of the combined efforts of a dedicated group of teachers, administrators, university staff, and Zoo education professionals to create a set of experiences that will support science learning for teachers and students from around the State.

The Louisville Zoo has a rich history in our region, and as the State Zoo of Kentucky, it is one of only 250 Accredited Zoos & Aquariums in the United States. Since opening in 1969, the Zoo has made it our mission to “better the bond between people and our planet”. Our MetaZoo Education Center has been a centerpiece of that mission for over 30 years, and has performed hundreds of educational classes, supported thousands of teachers, and created millions of memories through our up-close, nose-to-nose experiences with our animal ambassadors.

We believe in the power of educating children through experience and through the discovery of the natural world using questioning, observation and exploration. We are the ultimate outdoor classroom, and with the support of local universities, conservation organizations, and field scientists, we strive to inspire children to take conservation action to enact change in their world.

Thanks to a generous gift from Genentech, Inc. we have many new exciting materials to share with you, and hope that at the end of this program you will learn what makes the Zoo a phenomenal resource for you students’ learning and discover the many ways the we can support your classroom.

We hope you enjoy the program and we hope to see your students in the 2017-18 school year!
Project: Surviving in Your Ecosystem

Overview

This overview is intended to provide a quick summary of Project: Surviving in Your Ecosystem. For each unit, you will find a short description, learning goals, and learning experiences. For a more in-depth description and completed procedures, including necessary materials, you will need to reference the standard and subsequent resources.

UNIT 1

4-LS1-1 From Molecules to Organisms: Structures and Processes

This unit focuses on making connections between an animal’s ecosystem and their internal and external structure. Students will explore several fascinating species and explore its unique methods of survival. Individual experiences in this unit may be done together or independently but are written to be completed in the order in which they appear so students’ knowledge builds over time. It is at the discretion of the teacher to decide how long each activity in the unit should take, based on their students’ needs.

Learning Goals:

- Identify different external and internal structures of animals and their primary function.
- Discover how the ecosystem can impact the internal and external structures of an animal.
- Make predictions of internal and external structures based on limited ecosystem information.
- Compare and contrast external structures, specifically the horn and tusk.

Overview:

- Experience 1/Part 1: Students will participate in guided discussions about what animals need to survive. The methods for acquiring these needs will be explored and analyzed. Students will be exposed to a variety of different species and ecosystems. They will demonstrate their understanding of the relationship between the ecosystem and species by designing their own species. Supported SEPs & CCCs:
  - Practice 7: Engaging in argument from evidence
  - Crosscutting Concepts 4: Systems and system models
  - Crosscutting Concept 6: Structure and Function

Part 2 is the Zoo Field Study. Activities may be completed in a different order than listed due to break-out observation group sessions. Also included is a Zoo Walk as they make their way to their observations.

- Experience 1/Part 2: Students will be focusing their observations on animals found in the Sub-Saharan Region. Students will begin by identifying the many different ecosystems found there and discuss what they might expect to see because of that. Students will rotate between 8 animals, observing and taking notes on their external features. Supported SEPs & CCCs:
  - Practice 4: Analyzing and Interpreting Data
• **Experience 2/ Part 2:** Students will participate in a scientific inquiry based discussion led by their MetaZoo educator. They will begin exploring the similarities and differences between the species they observed. They will discover that several of the African animals they observed share very noticeable external features, like horns or tusks. Supported SEPs & CCCs:
  o Practice 4: Analyzing and Interpreting Data
  o Crosscutting Concept 1: Patterns
  o Crosscutting Concept 2: Cause and Effect

• **Experience 3/ Part 2:** Students will focus their investigation on the African elephant, and will learn to differentiate between horns, antlers, and tusks. Students will understand and be able to describe the importance of elephants and why they are considered a keystone species. The MetaZoo educator will also discuss the conservation components of the elephant species, including but not limited to the external structure, its tusk. Supported SEPs & CCCs:
  o Practice 4: Analyzing and Interpreting Data
  o Crosscutting Concept 2: Cause and Effect

• **Experience 4/ Post Field Study/ In Classroom:** This is an opportunity for your students to explore how kids can impact nature. Read about two young girls who made a big impact on the elephant’s conservation challenges. Supported SEPs & CCCs:
  o Practice 4: Analyzing and interpreting data

**UNIT 2**

4-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

*This Unit focuses on exploring and understanding how animals use their senses to survive. Students will learn that animals rely on different senses for different purposes. Individual experiences in this unit may be done together or independently but are written to be completed in the order in which they appear so students’ knowledge builds over time. It is at the discretion of the teacher to decide how long each activity in the unit should take, based on their students’ needs.*

**Learning Goals:**

- Make real world connections about how animals use different types of information gained through their senses
- Explore why animals depend on different senses for survival
- Participate in a “Jigsaw” book study
- Participate in a model exploring animals sense of smell
Overview:

- **Experience 1/ Part 1:** Students will listen to “The Blind Men and the Elephant”, a story that originated in the Indian subcontinent from where it has been widely diffused about a group of blind men who touch an elephant to learn what it is like. Students will begin their discussion about senses and how we use them. Supported SEPs & CCCs:
  - Practice 4: Analyzing and interpreting data

- **Experience 2/ Part 1:** Students will compare and contrast two different species that rely heavily on their sense of sight but for two very different reasons. Student will make predictions and watch two short videos comparing these species. Supported SEPs & CCCs:
  - Practice 7: Engaging in argument from evidence
  - Crosscutting Concept 6: Structure and function

- **Experience 3/ Part 1:** Using “Animal Senses, How Animals See, Hear, Taste, Smell, and Feel,” students will participate in a “Jigsaw” book investigation. Working within groups students will become sense experts. Supported SEPs & CCCs:
  - Practice 8: Obtaining, evaluating, and communicating information
  - Practice 2: Developing and using models
  - Crosscutting Concept 4: Systems and system models

- **Experience 4/ Part 1:** (The Model, Smell Maze) Students will explore their sense of smell and make real-world connections. Students will identify different ways in which an animal could utilize its sense of smell. Supported SEPs & CCCs:
  - Practice 2: Developing and using models
  - Practice 3: Planning and carrying out investigations
  - Crosscutting Concept 2: Cause and effect

In this Outreach Program students will be participating in a migration investigation. We will focus on providing a rich student lead classroom and the teachers will act as co-explorers and guides with the students.

- **Experience 1/ Part 2:** Students will learn about migration patterns and how animal are processing information within their environment. MetaZoo educator will begin by discussing migration patterns and the motivations behind them. Students will also participate in the “Zebra Migration” model. The students will be building on the knowledge they gained during their Field Study, which focused on African animals. Supported SEPs & CCCs:
  - Practice 2: Developing and using models
  - Practice 3: Planning and carrying out investigations
  - Crosscutting Concept 2: Cause and effect

- **Experience 2/ Part 2:** Meet and greet MetaZoo animals. Students will have the opportunity to meet several of our MetaZoo creatures, pulling together all the concepts investigated throughout the project: Surviving in Your Ecosystem. Students will learn about each animal’s internal and external features, how they acquire food and water, and explore how each animal utilizes its senses.

**End of Project Writing Activity**
SURVIVING IN YOUR ECOSYSTEM

UNIT 1
4-LS1-1 From Molecules to Organisms: Structures and Processes

Students who can demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lungs, brain, and skin.] [Assessment Boundary: Assessment limited to macroscopic structures within plant and animal systems.]

The performance expectation above was developed using the following elements from NRC document. A Framework for K-12 Science Education.

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<td>LS1.A: Structure and Function</td>
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<td>Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</td>
<td>Plants and animals have internal and external structures that serve various functions in survival, growth, behavior, and reproduction.</td>
<td>Systems and System Models</td>
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<td>• Construct an argument with evidence, data, and/or a model.</td>
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<td>• A system can be described in terms of its components and their interactions.</td>
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Connections to their DCIs in fourth grade: N/A

Articulation of DCIs across grade levels:


Common Core State Standards Connections:

ELA/Literacy — W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

Mathematics — 4.G.A.3 Recognize a line of symmetry for a two dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)
4-LS1-1 From Molecules to Organisms: Structures and Processes

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

Learning Goals:

- Students will identify different external and internal structures of animals and their primary function
- Students will predict internal and external structures of animals based on different ecosystems
- Students will design an animal with appropriate internal and external structures to support survival, growth, behavior, and/or reproduction

Unit 1 Procedures

These procedures are not intended to be completed in one day. The separate components of this Unit may be broken up at teacher’s own discretion.

Lesson designed to precede your Zoo Field Study. Please schedule your Zoo Field Study.

1. Teacher will pose the question:
   - “What do all animals need to survive?”
     - As students are brainstorming answers, the teacher will be recording student responses. Ultimately, the list should include food, water, and air. Additional answers may also be listed.
     - Briefly discuss that air is all around us at all times; it blows the trees, breezes by on a spring day, carries bubbles out of sight, etc…. Air has the necessary oxygen all animals need to survive. Oxygen is the most common chemical element found on or in Earth. It is one of the main elements that make up air, and it is necessary for the survival of all plants and animals.
     - Try: you can’t see your lungs, but it’s easy to feel them in action. Put your hands on your chest and breathe in very deeply. You will feel your chest getting slightly bigger. Now breathe out the air, and feel your chest return to its regular size. You’ve just felt the power of your lungs!

2. Pose the question:
   - “How do animals that live underwater breathe oxygen?”
     - Your students will answer gills; briefly explain the primary function of gills.
     - Land dwelling animals breathe oxygen through their lungs. The lungs of land dwelling animals would not work very well for a fish, because one breath underwater would fill them with water and make them useless. Nonetheless, fish need oxygen to breathe, too. In order to remove oxygen from the water, they rely on special organs called “gills.”
     - Gills are feathery organs full of blood vessels. A fish breathes by taking water into its mouth and forcing it out through the gill passages. As water passes over the thin walls of the gills, dissolved oxygen moves into the blood and travels to the fish’s cells.
     - The students will have answered where oxygen comes from and they will understand the difference between how land dwelling and water dwelling animals get the oxygen they need. As previously identified animals also need food and water to survive. Pose the questions:
• What are the different ways animals acquire their food source?
• What are the different ways animals acquire their water sources?

3. Record and/or discuss student responses.
4. Encourage reflection and expansion of ideas.
   o What about animals that live in the desert with a limited water supply?
   o What if the available food source was very big, or very small?
   o What if the available food source was underground, high in trees, or underwater?
   o How else could animals get the water need if they didn’t have access to lakes, rivers, or other fresh water sources?

5. Give each student a copy of “The Gaboon Viper” student resource. Prior to reading the article, have your students make some predictions based on their observations of the photographs provided:
   o As a class discuss the provided questions. Give student the opportunity to explain their thinking.
   o Individually students will read text “The Gaboon Viper” and complete questions provided.

6. As a class discuss what they have learned about the Gaboon viper. What did they learn about how this species survives?

7. Assign students to small groups (2 – 3 students).

8. Pass out animal exercises to each group. Using picture clues students will predict how each animal collects its food source or water source. Each animal provided has a very unique way of acquiring one of those resources. (Note: Some of the following animal exercises may need to be repeated.)
   o Food Source: frogfish, mantis shrimp, nudibranch, peregrine falcon, and chameleon
   o Water Source: thorny devil, desert tortoise

9. Give students 3 – 5 minutes to make and record predictions with their group. Students will need to provide explanations of their thinking.
   o After predictions, students will be given a brief explanation of each animal’s ecosystem and their methods of food and water collection. Found on back.
   o Students will share their predictions and actual food/collection methods with whole class.

10. After students have shared all 7 animals. Discuss:
    o Why do these animals have such different food/water collection methods?
    o Does the availability of food/water affect the method they use?
    o What external features supported their food/water collection methods?
    o What internal structures supported their food/water collection methods?

11. Working in the same groups students will receive a picture of a specific ecosystem; forest, grassland, tundra, desert, freshwater, and marine. Included will be a brief description of that ecosystem and availability of resources.
    o The groups will work together designing an animal that could successfully live in that ecosystem. Their designs should include a drawing of that animal, and labeled internal and external structures that support its survival.
    o Students will present their animals and explain how/why this animal has been specifically designed to survive in its ecosystem.
Additional ELA resource: During our Field Study students will be making observations on many different African animals and their physical characteristics. To get students thinking you may choose to read “How Elephant Got His Trunk: A Venda Tale from South Africa.”

Please complete this portion of your procedures after you have completed your Field Study.

- Review information about elephants and other animals students investigated while at their Field Study.
- Reflection: Is there anything we can do to help the elephants?
  - Watch video:
  - Read Article:
    - “Kids Help Elephants”
- Challenge your students to come up with their own action plan!
Looking at this Gaboon viper, predict how its physical features may influence its growth and survival?

What type of habitat do you predict the Gaboon viper calls home? Why?

How do you think this viper collects its food source?
After reading “The Gaboon Viper” reflect on the following questions. For question 2, you should be able to provide at least 3 examples.

1. The Gaboon viper breathes oxygen through its lungs; in what other way does the viper use its lungs? How does that effect its survival?

__________________________________________________________________________
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2. What physical characteristics did you learn about that effect the viper’s growth, survival, behavior, and/or reproduction?

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To see an animal that calls the leafy rainforest floor its home, you don't have to leave Louisville to spot...

THE GABOON VIPER
Student Resource 2: Unit 1

The Gaboon viper has several adaptations that have enabled it to survive in different habitats including tropical rainforests. Size is an adaptation that these snakes utilize. When you think of Gaboon vipers, you need to think BIG! Nearly everything about them is big, and their size plays a key role in their ability to survive in this environment. One of the first things you will notice about these vipers is their large bodies, both the length and girth. A more substantial body enables them to consume prey that many other snakes can’t manage; their hefty size also provides space for a large respiratory system which the Gaboon uses to deter potential predators. When confronted by a predator, Gaboons will inflate their lungs full of air enabling them to emit a very loud, long and frightening hiss that causes most animals to flee, including humans!

In addition to being very thick-bodied and able to grow over six feet in length, Gaboon vipers also have very big heads, an adaptation that serves multiple purposes. First of all, there are many plants with large leaves in tropical rainforests that end up falling to the forest floor; the size and shape of the Gaboon viper’s head makes it blend in with the leafy forest floor providing very effective camouflage. Secondly, a big head allows the Gaboon viper to accommodate the longest fangs of any snake in the entire world plus enormous venom glands. There are other snakes that have venom that is more potent than the Gaboon vipers, but the large glands enable this snake to inject prey with the highest venom yields of any species of snake on the planet. Having such long fangs also enables them to inject their venom very deep into a prey animal which makes it faster-acting and more effective. Many venomous snakes strike a prey animal and then release it, but not the Gaboon viper. Instead, they often bite and hold their prey, allowing them to pump their prey full of venom for a quicker kill.

Long-term survival and vigorousness of the species depends on superior size — reproduction would be compromised without it. Before Gaboon vipers reproduce, the males engage in combat with each other, and only those that survive go on to produce offspring. During combat, males begin by rubbing their chins along the back of their opponents raising their heads up as high as they can while becoming intertwined in an effort to physically topple each other over. Large size provides a distinct advantage in this competition. In order to achieve a size advantage, males must succeed in finding food over a long period of time — the reward being a larger size enabling them to pass on their successful genes to the next generation. The rigors of this process demonstrate how adaptations are rewarded through evolution in the natural world.
Looking at the photograph make a prediction about how this frogfish gets its food source.

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___________________________________________________________________________________
OVERVIEW
A fish swishes through the water just above a cluster of coral on the seafloor. Suddenly a hairy-looking, bloblike creature emerges from the coral, snags the fish in its mouth, and devours the snack. The bizarre being isn’t a mythical sea monster — it’s a hairy frogfish. And its appearance isn’t its only odd trait.

WALK IT OFF
The hairy frogfish is a type of fish that’s covered in spines. These spines, which resemble strands of hair, allow the marine animal to camouflage itself against coral and seaweed. Found mostly in warm waters around the world, the hairy frogfish can also change its color to blend in with its surroundings.

These animals may be excellent at hiding in plain sight. However they do something that really makes them stand out from a lot of other sea creatures. The fish — which usually grow about four inches long — don’t swim. Instead they walk on their wide fins along the seafloor as they look for snacks to eat.

GO FISH
When it comes to meals, hairy frogfish aren’t too picky. They chow down crustaceans and other fish such as flounder. These guys sometimes sneak up on their prey. But other times they make their prey come to them. Hairy frogfish have a special extra-long spine on their dorsal fins that looks like a worm. By waving this bait back and forth in front of their mouths, they can lure a target within striking distance. Talk about being put in a hairy situation!

Be prepared to share the interesting feeding methods of the frogfish. Make sure to describe what features makes its strange feeding habits possible!

http://kids.nationalgeographic.com/animals/hairyfrogfish/#hairy-frogfish-side.jpg
Looking at the photograph make a prediction about how this mantis shrimp gets its food source.
OVERVIEW
A rainbow-colored crustacean skitters along the ocean floor, adding a splash of brightness to the murky setting. The animal’s narrow, hard-shelled body sports orange, green, red, and blue hues. Known as the peacock mantis shrimp, this beautiful, seven-inch-long critter looks harmless. But the marine animal packs a punch — literally.

SHRIMP SMACKDOWN
Peacock mantis shrimp mostly live in shallow parts of the Indian and Pacific Oceans. The crustacean spends much of its time looking for crabs and mollusks to eat. When it finds a delicious-looking snack, the animal goes into full-on boxer mode. Springing out one of its club-like front claws, the animal delivers a swift punch to its prey. The punch is 50 times faster than the blink of an eye and strong enough to break glass!

These shrimp also rely on their sparring moves to keep enemies away from burrows in the ocean floor that they use as shelters. Hovering at the opening of its burrow, a peacock mantis shrimp will strike at intruders that come too close.

EYES ON THE PRIZE
The crustacean has another eye-popping feature in addition to its strong punch. Its eyes — which protrude from its head and move independently — can see in two different directions at once. They can also detect colors that humans are unable to see. It’s easy to be floored by this animal’s cool traits!

Be prepared to share the interesting feeding methods of the Mantis Shrimp. Make sure to describe what features makes its strange feeding habits possible!
http://kids.nationalgeographic.com/animals/peacockmantisshrimp/#mantis-shrimp-profile.jpg
Looking at the photograph make a prediction about how this nudibranch gets its food source.

___________________________________________________________________________________

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OVERVIEW
A blob the size of a teacup slinks along the ocean floor in the shallow waters off of Australia. It’s a type of sea slug called the nudibranch (NEW-dih-bronk), a slime-oozing creature with a boneless body. Many of them also sport brilliant colors and eye-catching patterns on their skin. In fact this sticky slug is often considered one of the most beautiful animals in the world.

IN THE MOOD FOR FOOD
Over 3,000 species of nudibranchs exist, and most live in shallow, tropical waters. They can be anywhere from a quarter of an inch to 12 inches long and can weigh up to 3.3 pounds. These sea slugs spend their time sliding on their bellies around their habitat in search of snacks. The animals have a set of curved teeth, which they use to eat coral, sponges, and fish eggs off the ocean floor. Nudibranchs use tentacles on their heads to poke around for grub.

TRUE COLORS
The nudibranch’s meals don’t just satisfy its hunger — the food also gives the animal its coloring. When the sea slug eats, it absorbs and displays its prey's pigment — the substance that gives the prey its color. Some nudibranchs also absorb toxins from certain prey and secrete the poison from their own skin. This allows them to fend off enemies such as fish. So the nudibranch is stunning, resourceful, and it recycles? This slug sounds far from sluggish!

Be prepared to share the interesting feeding methods of the nudibranch. Make sure to describe how its physical are impacted!

http://kids.nationalgeographic.com/animals/nudibranch/#nudibranch_white.png
Looking at the photograph make a prediction about how this peregrine falcon gets its food source.

___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________
OVERVIEW

Swoosh! A peregrine falcon can dive up to 200 miles (323 kilometers) an hour to capture prey in flight, striking in midair with its outstretched talons, or claws. Peregrines usually hunt with either a swift chase or a fast dive. Starlings, pigeons, and doves are among their favorite meals.

A common bird of prey (a group of hunting birds that includes such birds as hawks and eagles), the peregrine is an adaptable falcon that can be found in almost any habitat. Peregrines live from cold tundra to hot deserts, from sea level to high in the mountains. Their adaptability even allows them to thrive in cities. They live in a greater variety of habitats than almost any other bird of prey. Some peregrine falcons migrate in the winter from their nesting grounds in the Arctic all the way to South America—a round-trip distance of up to 15,500 miles (24,945 kilometers). They make the return trip north when it’s time to mate and lay eggs.

Peregrines don’t build nests. They usually just find a shallow dip in some rocks or scrape a depression in the soil on the ledge of a cliff, or even use the ledge of a building. Female peregrines lay two to four eggs at a time. Parents incubate the eggs for about a month until the eggs hatch. Peregrine chicks stay in the nest for up to six weeks, by which time they’ve learned to fly.

Peregrine falcons in the United States were listed as an endangered species after their numbers dropped dangerously low between the 1950s and the 1970s. Certain pesticides used by farmers—including DDT—harmed the peregrines by causing their eggshells to be dangerously thin—so fragile that they broke when the parents tried to incubate them. Laws were enacted to ban DDT and, fortunately the ban, along with other conservation efforts, led to the recovery of the species. In fact, scientists think there now may be more peregrines in some parts of their range than there ever used to be!

Be prepared to share the interesting feeding methods of the peregrine falcon. Make sure to describe what features makes its strange feeding habits possible!

CHAMELEON EXERCISE
Student Resource 7: Unit 1

Looking at the photograph make a prediction about how this chameleon gets its food source.

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___________________________________________________________________________________
___________________________________________________________________________________
OVERVIEW
A chameleon sits motionlessly on a tree branch. Suddenly its sticky, two-foot-long tongue snaps out at 13 miles an hour, wrapping around a cricket and whipping the yummy snack back into the reptile’s mouth. Now that’s fast food dining! And the chameleon’s swift eating style is just one of its many features that’ll leave you tongue-tied.

COLORFUL CRITTERS
Chameleons mostly live in the rain forests and deserts of Africa. The color of their skin helps them blend in with their habitats. Chameleons that hang out in trees are usually green. Those that live in deserts are most often brown.

They often change color to warm up or cool down. (Turning darker helps warm the animals because the dark colors absorb more heat.) They also switch shades to communicate with other chameleons, using bright colors to attract potential mates or warn enemies.

So how exactly do chameleons change colors? The outer layer of their skin is see-through. Beneath that are layers of special cells filled with pigment—the substance that gives plants and animals (including you) color. To display a new color, the brain sends a message for these cells to get bigger or smaller. As this happens, pigments from different cells are released, and they mix with each other to create new skin tones. For instance, red and blue pigment may mix to make the chameleon look purple.

EYES EVERYWHERE
Over 150 species of chameleons exist, ranging from the size of your thumbnail to that of a house cat. Some species of chameleon (such as the tiger chameleon) are endangered, but others (like the Drakensberg dwarf chameleon) are not. No matter their differences, all chameleons have a prize pair of eyes. Their peepers can move in two different directions at once, giving the lizards a panoramic view of their surroundings. This eye-popping reptile really knows how to scale up the cool factor.

Be prepared to share the interesting feeding methods of the chameleon. Make sure to describe what features makes its strange feeding habits possible!

http://kids.nationalgeographic.com/animals/chameleon/#chameleon-sleepy.jpg
THORNY DEVIL EXERCISE

Student Resource 8: Unit 1

Looking at the photograph make a prediction about how this thorny devil gets its water source.
It’s early morning in the Australian desert, and a squat, palm-sized lizard called the thorny devil is having a drink. It hasn’t rained for weeks, and there’s no water in sight. The lizard’s body is still and its head is raised. And yet, through almost no effort, it is quenching its thirst.

Its secret lies in its extraordinary skin. Between the intimidating and ostentatious spikes, there’s a subtle network of microscopic grooves. These can yank water out of moist sand, drawing the fluid up against the pull of gravity, across the lizard’s body, and into its waiting mouth. All it needs to do is to stand in the right spot and without flexing a muscle, it can drink with its skin.

Be prepared to share how the thorny devil is able to get its water source in its very dry habitat.

Looking at the photograph make a prediction about how this Desert Tortoise gets its water source.

___________________________________________________________________________________
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___________________________________________________________________________________
OVERVIEW
Five eggs the size of Ping-Pong balls crack open as the tiny desert tortoises inside break through the shells. The two-inch-long babies immediately crawl off in search of flowers and grasses to eat. These animals may be newly hatched, but they already have survival skills that will allow them to thrive in their harsh, sizzling-hot habitats.

BURROW BUILDERS
Desert tortoises live in the deserts of the southwestern United States and northwestern Mexico. During the summer, ground temperatures in parts of their range can hit 140°F. To beat the heat, desert tortoises use their strong forearms and tough nails to dig underground burrows where they can hide from the sun. Some of these tortoise tunnels are up to 32 feet in length. And the burrows can get pretty crowded. As many as 25 desert tortoises might bunk together in one shelter.
The animals also dig grooves into the ground’s surface to catch rainwater. After a storm, they’ll return to these holes to slurp up the water that’s collected inside. Once it’s had a good drink, a desert tortoise can go up to a year without requiring fresh water again. The reptile stores the water it has consumed in its bladder and can later absorb the liquid when it needs to hydrate.

TORTOISE TUSSLE
Despite sometimes hanging out in burrows together, desert tortoises are pretty solitary. And sometimes when males come across each other, they’ll fight to establish dominance. The dueling duo may use horns on their chests to try and knock each other over. The contest ends when one animal flips the other on its back. The losing tortoise can turn right side up by wiggling its body back and forth until it flips over. But after that, the tortoise knows who’s boss. Sounds like a tortoise’s shell isn’t the only thing about it that’s tough!

Be prepared to share how the desert tortoise is able to get its water source in its very dry habitat.

http://kids.nationalgeographic.com/animals/deserttortoise/#deserttortoiseeating.jpg
Forest ecosystems are classified according to their climate type as tropical, temperate or boreal. In the tropics, rainforest ecosystems contain more diverse vegetation than ecosystems in any other region on earth. In these warm, moisture-rich environments, trees grow tall and greenery is lush and dense, with species living from the forest floor all the way up to the canopy. In temperate zones, forest ecosystems may be deciduous, coniferous or oftentimes a mixture of both, in which some trees shed their leaves each fall, while others remain evergreen year-round. In the far north, just south of the Arctic, boreal forests -- also known as taiga -- feature abundant coniferous trees.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it…

- What are the external features of this creature? Internal?
- Why are these features needed in this habitat?
- What does this creature eat?
- What does this creature do during the day? Or is it nocturnal?
- Does this creature have any natural predators?
- How does your creature protect itself from predators?
- Does your creature live on land or in water? A combination?
- How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own forest dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.

Explanation

____________________________________________________________________________________
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____________________________________________________________________________________
Different types of grassland ecosystems can be found in prairies, savannas and steppes. Grassland ecosystems are typically found in tropical or temperate regions, although they can exist in colder areas as well, as is the case with the well-known Siberian steppe. Grasslands share the common climactic characteristic of semi-aridity. Trees are sparse or nonexistent, but flowers may be interspersed with the grasses. Grasslands provide an ideal environment for grazing animals.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it...

- What are the external features of this creature? Internal?
- Why are these features needed in this habitat?
- What does this creature eat?
- What does this creature do during the day? Or is it nocturnal?
- Does this creature have any natural predators?
- How does your creature protect itself from predators?
- Does your creature live on land or in water? A combination?
- How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own grassland dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.
As with deserts, a harsh environment characterizes ecosystems in the tundra. In the snow-covered, windswept, treeless tundra, the soil is frozen year-round, a condition known as permafrost. During the brief spring and summer, snows melt, producing shallow ponds which attract migrating waterfowl. Lichens and small flowers may become visible during this time of year. The term “tundra” most commonly denotes polar areas, but at lower latitudes, tundra-like communities known as alpine tundra may be found at high elevations.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it…

• What are the external features of this creature? Internal?
• Why are these features needed in this habitat?
• What does this creature eat?
• What does this creature do during the day? Or is it nocturnal?
• Does this creature have any natural predators?
• How does your creature protect itself from predators?
• Does your creature live on land or in water? A combination?
• How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own tundra dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.

**Explanation**

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____________________________________________________________________________________
The common defining feature among desert ecosystems is low precipitation, generally less than 25 centimeters (10 inches) per year. Not all deserts are hot -- desert ecosystems can exist from the tropics to the arctic, but regardless of latitude, deserts are often windy. Some deserts contain sand dunes, while others feature mostly rock. Vegetation is sparse or nonexistent, and any animal species, such as insects, reptiles and birds, must be highly adapted to the dry conditions.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it…

• What are the external features of this creature? Internal?
• Why are these features needed in this habitat?
• What does this creature eat?
• What does this creature do during the day? Or is it nocturnal?
• Does this creature have any natural predators?
• How does your creature protect itself from predators?
• Does your creature live on land or in water? A combination?
• How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own desert dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.
Freshwater ecosystems can be found in streams, rivers, springs, ponds, lakes, bogs and freshwater swamps. They are subdivided into two classes: those in which the water is nearly stationary, such as ponds, and those in which the water flows, such as creeks. Freshwater ecosystems are home to more than just fish: algae, plankton, insects, amphibians and underwater plants also inhabit them.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it....

- What are the external features of this creature? Internal?
- Why are these features needed in this habitat?
- What does this creature eat?
- What does this creature do during the day? Or is it nocturnal?
- Does this creature have any natural predators?
- How does your creature protect itself from predators?
- Does your creature live on land or in water? A combination?
- How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own freshwater dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.
Student Resource 15: Unit 1

Marine ecosystems differ from freshwater ecosystems in that they contain saltwater, which usually supports different types of species than does freshwater. Marine ecosystems are the most abundant types of ecosystems in the world. They encompass not only the ocean floor and surface but also tidal zones, estuaries, salt marshes and saltwater swamps, mangroves and coral reefs.

http://sciencing.com/types-environmental-ecosystems-8640.html

Think about it.....

• What are the external features of this creature? Internal?
• Why are these features needed in this habitat?
• What does this creature eat?
• What does this creature do during the day? Or is it nocturnal?
• Does this creature have any natural predators?
• How does your creature protect itself from predators?
• Does your creature live on land or in water? A combination?
• How does your animal drink water?
Using the information about forest ecosystems and what you have learned about how other animals acquire their necessary resources, design your own marine dwelling creature!

Be sure to label any internal or external structures that support its survival, and provide a brief explanation of your creature in the space provided.
Long, long ago, some animals didn’t look like they do today. One of these was Ndou the Elephant. You see, in the beginning, Ndou had a short snout. This made eating very hard work. Elephants couldn’t reach the tastiest leaves at the tops of the trees. It was also tricky for such big animals to bend down and snuffle out the best shoots under small brushes near the ground.

This wasn’t the only problem with short snouts. Elephants need to drink a lot of water. So they had to kneel down beside the waterhole or river to swallow the many mouthfuls they needed. It was even worse in the dry season when everything dried up.

So it happened that one year, after many moons without rain, a herd of elephants trekked over the mountains, hoping to find water in the valley on the other side. They were relieved to glimpse water shimmering in the distance. It was a lake. Their great feet churned up the dust as they hurried towards it.

As the elephants dropped to their knees and sank their snouts into the water, a hungry crocodile slunk silently towards them.

Lifting one eye above the surface, he eyed a young bull elephant who kept himself slightly apart from the others. Crocodile lunged. Razor-sharp teeth sank into Ndou’s snout. So began a fearful tug-of-war.

The young bull, Ndou, was furious. How dare Crocodile make fun of his snout! Every time Crocodile pulled, trying to drag him into the water, Ndou heaved and hauled. With all his might, he tried to get away, trying to ignore the terrible pain.

But something strange was happening. With each tug and yank, Ndou felt his snout stretch. Little by little, it was becoming longer…and longer…and longer! Now it was no longer a snout, it was a nose and, after a while, it was no longer a nose, it was… a trunk!

The sun had been high in the sky when the tug-of-war began. Now the sun was deep red, slipping behind purple hills. Crocodile felt himself lose his grip. There would be no young elephant for dinner. As Crocodile unclenched his jaws, Ndou jolted backwards — suddenly free!

Some other elephants had stayed close to the young bull, trying to support him during the long tug-of-war. They helped him onto his feet. But when they saw his snout was now a long, narrow tube, almost reaching the ground, they couldn’t help laughing. How funny!

Poor Ndou felt very upset, especially when he looked at his reflection in the water. His nose was tender and sore. It was also wobbly and, at first, he couldn’t control it.

He kept far away from the others, who couldn’t help staring at his long trunk.

How Elephant Got His Trunk

A Venda Tale from South Africa

Teacher Read Aloud

Long, long ago, some animals didn’t look like they do today. One of these was Ndou the Elephant. You see, in the beginning, Ndou had a short snout. This made eating very hard work. Elephants couldn’t reach the tastiest leaves at the tops of the trees. It was also tricky for such big animals to bend down and snuffle out the best shoots under small brushes near the ground.

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Poor Ndou felt very upset, especially when he looked at his reflection in the water. His nose was tender and sore. It was also wobbly and, at first, he couldn’t control it.

He kept far away from the others, who couldn’t help staring at his long trunk.
But little by little, Ndou began to learn what he could do with his trunk. He was soon collecting the juiciest leaves and berries high up in trees. It was easy to uproot sweet young grasses from the ground and winkle out fresh shoots hidden under dense bushes. When it came to drinking, he no longer had to kneel down like all the others. He could simply slurp up what he needed and squirt the water into his mouth. He could even slosh water over himself to keep cool!

The other elephants soon noticed. Instead of laughing at the young bull, they now began to envy him. Ndou even began to enjoy showing off his trunk-tricks and skills. Then, one by one, at night, elephants began to disappear and return in the morning without a snout but a trunk instead! Each looked very tired, and a bit sheepish, but happy.

Was it always the same old crocodile who offered the tug-of-war? We don’t know. If it was, he must have become very, very hungry indeed. Nowadays, elephants are born with trunks, but they still use their mouths to suckle from their mothers and to drink from a waterhole. It takes a long time to learn how to use a long, wobbly trunk.
Thanks in part to the hard work of three young girls, the Hong Kong government began May 15 to destroy the majority of its stockpile of confiscated elephant ivory.

Nellie Shute, age 12, Christina Seigrist, age nine, and Lucky Lan Skrine, age 11, were attending international schools in Hong Kong when they learned what was happening to elephants. They formed the group Elephant Angels and collected more than 18,000 signatures asking the government to destroy the ivory.

Elephants are hunted illegally for their ivory tusks, which often wind up on the black market in Hong Kong. Fewer than 500,000 elephants roam Africa today, down from several million a century ago. At current poaching rates, experts warn that elephants may become nearly extinct within decades.

“I was really worried that if we don’t do anything, I will not be able to see elephants in real life when I grow up,” Christina Seigrist said.

Nellie Shute started helping elephants by making and selling elephant greeting cards. She raised $250, which she donated to the David Sheldrick Wildlife Trust in Kenya for the care of an elephant orphan.

Nellie then wrote a note to her principal at the Hong Kong International School telling him that she didn’t think her school should have confiscated ivory on display for “educational” purposes. Her principal agreed to send the ivory back to the government.

While the latest petition and planned ivory destruction are huge accomplishments for Nellie and the other members of Elephant Angels, the girls aren’t stopping there. They’ve been protesting outside stores in Hong Kong that sell ivory and educating passersby about where the ivory comes from.

“I speak Chinese,” Christina said, “and I was able to talk to kids visiting from mainland China . . . It was shocking to find out that they thought the tusks just fall off the elephants. They were horrified and immediately told their parents right there not to buy the ivory.”

Since the girls began protesting, the three largest ivory retailers in Hong Kong have stopped selling ivory. Now, the girls have set a goal of a total ban on ivory trade in Hong Kong and have created an online petition with more than four thousand signatures collected so far.


Published May 27, 2014; Updated August 12, 2014
UNIT 2

SURVIVING IN YOUR ECOSYSTEM
4-LS1-2 From Molecules to Organisms: Structures and Processes

Students who can demonstrate understanding can:
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or by the mechanisms of how sensory receptors function.]

The performance expectation above was developed using the following elements from NRC document. A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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<tbody>
<tr>
<td><strong>Developing and Using Models</strong></td>
<td><strong>LS1.D: Information Processing</strong></td>
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<tr>
<td>Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</td>
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<tr>
<td>• Use a model to test interactions concerning the functioning of a natural system</td>
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Connections to their DCIs in fourth grade: N/A
Articulation of DCIs across grade levels:
MS.LS1.A; MS.LS1.D
Common Core State Standards Connections:
ELA/Literacy —
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)
4-LS1-2 From Molecules to Organisms: Structures and Processes

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Learning Goals:
- Students will make real world connections about how animals use different types of information gained through their senses
- Students will predict how and why animals depend on their senses to process information in their environment
- Students will participate in a model that showcases how animals depend on their senses for survival

Unit 2 Procedures

These procedures are not intended to be completed in one day. The separate components of this Task may be broken up at teacher’s own discretion.

Lesson designed to precede your Outreach Experience. Please schedule your Outreach.

1. Read aloud to class “The Blind Men and the Elephant”. A folk tale from India that teaches intercultural awareness by illustrating how different perspectives lead to distinct points of view
   - Briefly discuss the background before/after reading text aloud to class
     - Region: Asia  Country: India  Resource Type: Folk Tale
   - Folk Tale: a story originating in popular culture typically passed on by word of mouth.
   - Engage students in discussion;

2. Why did the blind men start to argue?
   - What kind of information could the men have collected if they were limited to a difference sense; taste, smell, sound, or sight?
   - When do you depend on your; sight, smell, touch, taste, and sound?
   - What are some ways in which animals depend on their senses?
   - Do you think that different animals rely on different sense? Can you explain your thinking?

3. Follow the links below to learn how dragonflies and birds use their keen sight.
   - Prediction: “Can you predict why dragonflies and birds of prey rely so heavily on their sense of sight? While both have impressive sight abilities, the reasons are different, can you predict the difference?”
     - Sharpest eyesight — Birds of prey: Answer
     - Best motion detectors — insects: Answer
   - https://www.youtube.com/watch?v=m5XUdvBO_TE
   - https://www.youtube.com/watch?v=rb9CAliLgIA
   - Reflect on predictions.

Teacher note: During the next few days you will need to have a copy of “Animal Senses, How Animals See, Hear, Taste, Smell and Feel,” written by Pamela Hickman and Pat Stephens. You will need to make copies of suggested sections for presentation purposes.
   - Suggested activity: Jigsaw book sections.

1. Directions: Read to class the Introduction, page 4. Explain that you will be dividing the class into groups of 4. Each group will be responsible for becoming "experts" on their section. Divide the
reading selection into four segments; Sight: pages 6 – 14, Sound: pages 16 – 22, Smell: pages 24 – 30, Taste/ Surprising Senses: pages 32 – 38. Students will read their selections and may choose to take turns reading to the group, choose a reader, or a combination. There are several experiments throughout the book; encourage your groups to try those that do not need any materials. Sections on smell and taste have experiments that require materials. Working together students will complete the “Look What I Read About” student resource. Every student will have a completed graphic organizer to utilize as they “teach” their peers about their expert topic.

2. Reorganize groups so that in each new group there is one “expert” from each of the 4 topics. Allow students to present their topic to the new groups using their Look What I Read About graphic organizer.

3. After all four sections have been discussed, allow students time to explore the experiments (limited again to those that do not need additional materials).
   - In summary have students work together to complete Animal Senses/ Graphic Organizer.

4. As a whole group encourage discussion about what they learned.
   - What did you find most interesting?
   - What sense do you think animals rely on the most? Why?
   - What generalizations can you make?
   - Did you find any interesting patterns or relationships? What were they? Any surprises?
   - ** (Connect Unit 1) Is there any relationship between an animal’s physical/internal structures and how they use their senses? What are they?

5. Explore your senses! Transition students to participate in model (see procedures). This model is designed to explore the sense of smell. Animals rely on their sense of smell for a variety of reasons: to find food/water, attract/find mates, detect danger/predators, identify other animals’ territory, etc....
Long ago six old men lived in a village in India. Each was born blind. The other villagers loved the old men and kept them away from harm. Since the blind men could not see the world for themselves, they had to imagine many of its wonders. They listened carefully to the stories told by travelers to learn what they could about life outside the village.

The men were curious about many of the stories they heard, but they were most curious about elephants. They were told that elephants could trample forests, carry huge burdens, and frighten young and old with their loud trumpet calls. But they also knew that the Rajah’s daughter rode an elephant when she traveled in her father’s kingdom. Would the Rajah let his daughter get near such a dangerous creature?

The old men argued day and night about elephants. “An elephant must be a powerful giant,” claimed the first blind man. He had heard stories about elephants being used to clear forests and build roads.

“No, you must be wrong,” argued the second blind man. “An elephant must be graceful and gentle if a princess is to ride on its back.”

“You’re wrong! I have heard that an elephant can pierce a man’s heart with its terrible horn,” said the third blind man.

“Please,” said the fourth blind man. “You are all mistaken. An elephant is nothing more than a large sort of cow. You know how people exaggerate.”

“I am sure that an elephant is something magical,” said the fifth blind man. “That would explain why the Rajah’s daughter can travel safely throughout the kingdom.”

“I don’t believe elephants exist at all,” declared the sixth blind man. “I think we are the victims of a cruel joke.”
Finally, the villagers grew tired of all the arguments, and they arranged for the curious men to visit the palace of the Rajah to learn the truth about elephants. A young boy from their village was selected to guide the blind men on their journey. The smallest man put his hand on the boy’s shoulder. The second blind man put his hand on his friend’s shoulder, and so on until all six men were ready to walk safely behind the boy who would lead them to the Rajah’s magnificent palace.

When the blind men reached the palace, they were greeted by an old friend from their village who worked as a gardener on the palace grounds. Their friend led them to the courtyard. There stood an elephant. The blind men stepped forward to touch the creature that was the subject of so many arguments.

The first blind man reached out and touched the side of the huge animal. “An elephant is smooth and solid like a wall!” he declared. “It must be very powerful.”

The second blind man put his hand on the elephant’s limber trunk. “An elephant is like a giant snake,” he announced.

The third blind man felt the elephant’s pointed tusk. “I was right,” he decided. “This creature is as sharp and deadly as a spear.”

The fourth blind man touched one of the elephant’s four legs. “What we have here,” he said, “is an extremely large cow.”

The fifth blind man felt the elephant’s giant ear. “I believe an elephant is like a huge fan or maybe a magic carpet that can fly over mountains and treetops,” he said.

The sixth blind man gave a tug on the elephant’s coarse tail. “Why, this is nothing more than a piece of old rope. Dangerous, indeed,” he scoffed.

The gardener led his friends to the shade of a tree. “Sit here and rest for the long journey home,” he said. “I will bring you some water to drink.”

While they waited, the six blind men talked about the elephant.

“An elephant is like a wall,” said the first blind man. “Surely we can finally agree on that.”

“A wall? An elephant is a giant snake!” answered the second blind man.

“It’s a spear, I tell you,” insisted the third blind man.

“I’m certain it’s a giant cow,” said the fourth blind man.

“Magic carpet. There’s no doubt,” said the fifth blind man.

“Don’t you see?” pleaded the sixth blind man. “Someone used a rope to trick us.”

Their argument continued and their shouts grew louder and louder.

“Wall!” “Snake!” “Spear!” “Cow!” “Carpet!” “Rope!”

“Stop shouting!” called a very angry voice.

It was the Rajah, awakened from his nap by the noisy argument.

“How can each of you be so certain you are right?” asked the ruler.

The six blind men considered the question. And then, knowing the Rajah to be a very wise man, they decided to say nothing at all.

“The elephant is a very large animal,” said the Rajah kindly. “Each man touched only one part. Perhaps if you put the parts together, you will see the truth. Now, let me finish my nap in peace.”

When their friend returned to the garden with the cool water, the six men rested quietly in the shade, thinking about the Rajah’s advice.

“He is right,” said the first blind man. “To learn the truth, we must put all the parts together. Let’s discuss this on the journey home.”

The first blind man put his hand on the shoulder of the young boy who would guide them home. The second blind man put a hand on his friend’s shoulder, and so on until all six men were ready to travel together.
ANIMAL SENSES

SIGHT

SMELL

TASTE

SOUND

3 Interesting Facts

3 Interesting Facts

3 Interesting Facts

3 Interesting Facts
Using the Sense of Smell Model

Objective
Model the use of smell by navigating through a “smell maze.” Make real-world connections exploring how animals utilize their sense of smell.

What You’ll Need
- 13 small unmarked canisters
- Lemon extract
- Orange extract
- Cotton balls
- Yellow and green dot labels (or any 2 available colors)

The Set-up

Step 1
As a class, list the ways in which an animal could utilize its sense of smell:
- Find food/water, attract/find mates, detect danger/predators, identify other animals’ territory, etc….

Step 2
Place the cotton balls inside the canisters. Each canister will receive 2-3 drops of extract, 7 canisters will have lemon extract and 6 will have orange extract. Place dot labels, yellow for lemon extract and green for orange extract, on the bottom of canister (or on back, they should be placed where the answer is not visible).

Step 3
Pair 12 students. Each pair will have 1 lemon extract and 1 orange extract. There will be 1 remaining lemon extract. Have each pair line up in a row, one pair behind the other. The order that each pair holds the extract should vary, those students will be aware of which extract they are holding.

```
Y  Y  G  G  G  Y
G  G  Y  Y  Y  G
```

Step 4
Select one student to be the “animal.” This student must tell the class what animal he/she represents and how they are going to use their sense of smell. Example: “I am a Lion; I am using my sense of smell to find food.”

** Limitation to this model; some animals rely on their sense of smell more so than others, students may identify weak or incorrect examples. For example, some species of whales have no sense of smell.**
Step 5
Pair by pair the selected student will attempt to correctly match their lemon extract along the “smell maze.” Stopping at each pair, the selected student will smell both canisters 1 time. He/she will determine who they think is holding their matching extract. The pair will acknowledge if the student is correct or incorrect. If correct he/she will continue along the maze until the end. If the student correctly guesses 6 times they have successfully completed the maze: “The lion was able to use its sense of smell to lead him/her a food source.” If the student guesses incorrectly they will sit down, allowing other students an opportunity to try to the “smell maze.”

Step 6
Reorganize students as many times as needed so that everyone has had a turn to try the maze.

Extensions:
- Do you think the rate of success would be impacted if students were to do the maze with their eyes closed? Can you think of an animal that faces a similar challenge.
- What if time were a constraint? Would the rate of success be impacted if they had to complete the maze in 20 seconds? 15 seconds? 10 seconds? When might an animal have to make very quick discussions? Can you think of an animal that faces a similar challenge.
- Would the rate of success change if they had to smell the scent from 2 inches away? 3 inches? 5 inches? Can you think of an animal that faces a similar challenge.
End of Project Writing Reflection

Read aloud to class *Elephant*, written by Judy Allen, illustrated by Tudor Humphries.

“In this moving and mysterious story about a young girl and magical necklace, readers learn about the plight of elephants who are being killed for their valuable ivory tusks. An informative fact sheet about elephants at the end of the book encourages children to write to the organization listed to find out more about endangered animals and how they are being protected”

**Connections:**
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- Elephant tusks: Tusks are used for defense, offense, digging, lifting objects, gathering food, and stripping bark to eat from trees. They also protect the sensitive trunk, which is tucked between them when the elephant charges. In times of drought, elephants dig water holes in dry riverbeds by using their tusks, feet, and trunks.

4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- Writing Reflection Prompt:
  Tell the story from either the mother elephant or baby elephant's point of view. Begin your reflection when Hannah's car stopped suddenly while visiting the game reserve.
Student Resource End of Project Writing Prompt

Surviving in Your Ecosystem

Tell the story from either the mother elephant or baby elephant’s point of view. Begin your reflection when Hannah’s car stopped suddenly while visiting the game reserve.
THINGS TO DO WHEN I GET BACK TO SCHOOL:

• Schedule my field study

• _________________________________________________________________________

• _________________________________________________________________________

• _________________________________________________________________________

• _________________________________________________________________________

• _________________________________________________________________________
SPECIAL THANKS TO
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