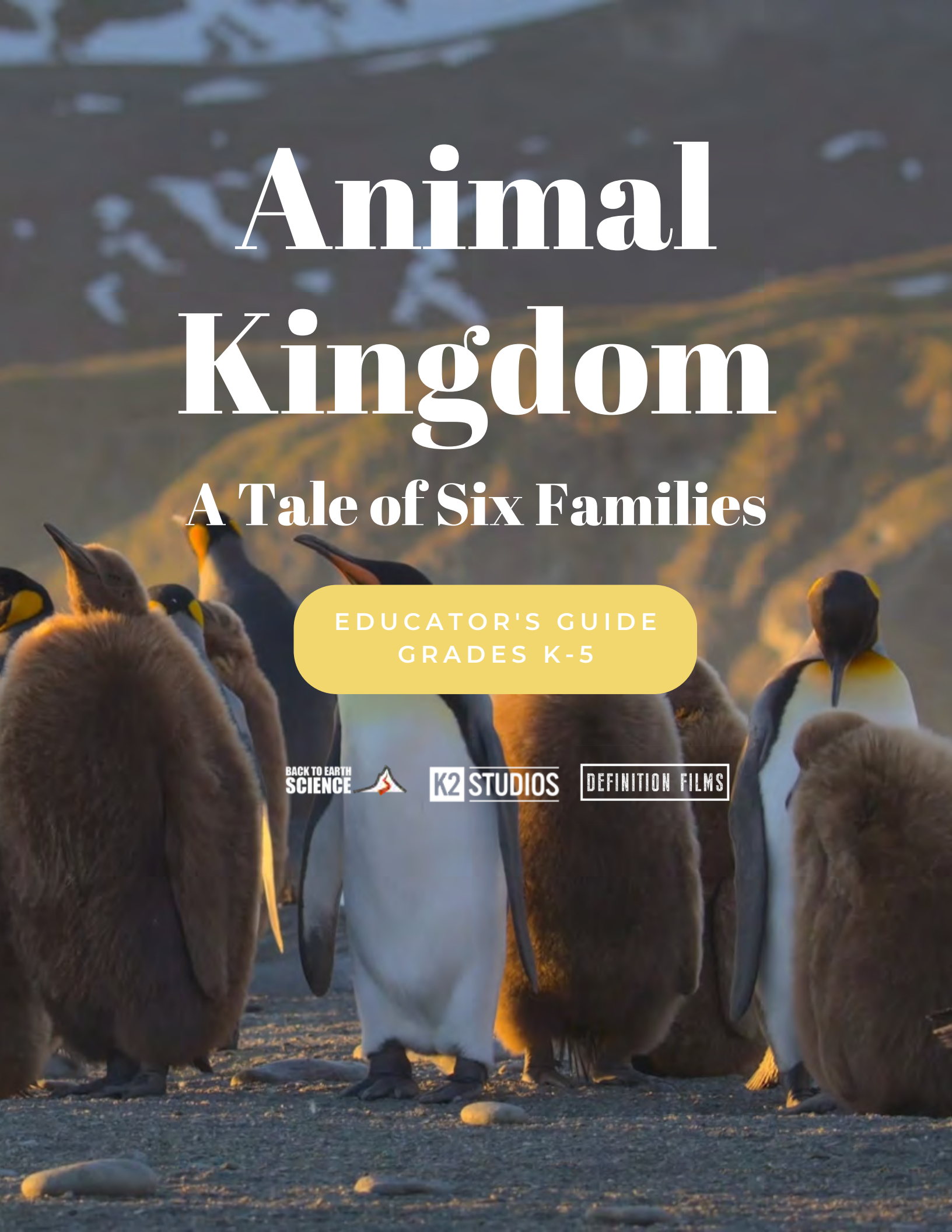


Animal Kingdom

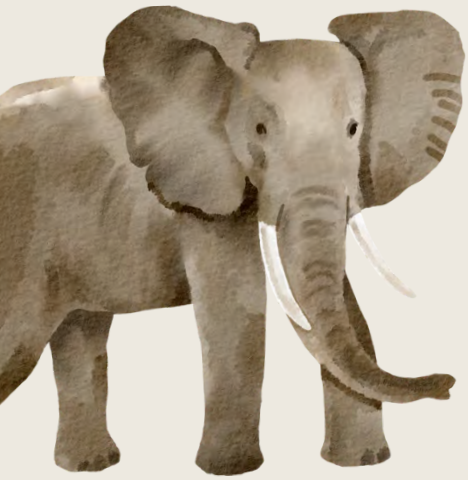
A Tale of Six Families

EDUCATOR'S GUIDE
GRADES K-5

BACK TO EARTH SCIENCE

K2 STUDIOS

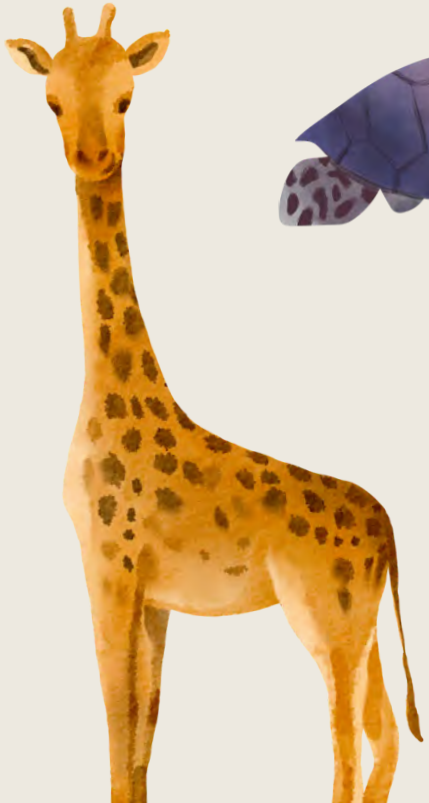
DEFINITION FILMS












Content

Welcome

This Educator's Guide for Grades K-5 offers experiential learning opportunities for students who watch **Animal Kingdom: A Tale of Six Families**, through outdoor activities, scientific experiments, large group simulations, and creative activities in art or drama. In each lesson, Activity 1 is recommended before watching the film, while activities 2-4 are recommended after watching the film. All lessons connect to the Next Generation Science Standards (NGSS), covering interdependent relationships in ecosystems, the flow of energy in an ecosystem, environmental impacts on animals, and more. By studying the six mightiest animal families, students will see how each animal plays an important part in balancing life on Earth and how humans have a unique role in protecting the extraordinary animal kingdom.

SIX FAMILIES IN THE ANIMAL KINGDOM

Insects
Birds
Fish
Reptiles
Amphibians
Mammals

Did you know there are more than six animal families? The animal kingdom is home to thousands of animals outside of the big six families, including snails, sea anemones, and spiders.

TAKING STUDENTS OUTSIDE

- Create a code of conduct with students on safety and care for the natural world.
- Ensure students work in pairs or small groups.
- Set clear boundaries on where students can go.
- Create a call or a signal to indicate when it is time to rejoin the group.
- Have extra clothing available to help students dress for the weather.

Glossary

Adapt: The ability to change one's body (like growing thicker fur) or change one's behaviour (like switching a diet from insects to berries) to survive.

Antennae: Thin sensory organs on top of an insect's head.

Cold-blooded (Animal): An animal whose body temperature depends on the temperature of the environment. Reptiles, insects, and fish are cold-blooded.

Decomposer: A living being who breaks down and eats deceased beings.

Ecosystem: A group of living beings interacting with each other and with the physical environment.

Energy: The available power for an animal to go about their daily activities.

External Structures: Parts of an animal that are visible on the outside of their body, such as ears, a tail, or scales.

Food Web: Describes who eats who in a particular region and which direction the energy flows between these beings.

Gills: An organ in some water-dwelling animals that brings oxygen into the body so the animal can breathe.

Habitat: A place where living beings can meet their needs to survive.

Internal Structures: Parts of an animal that are inside the body, such as a heart and lungs.

Lungs: An organ in some animals that brings oxygen into the body so the animal can breathe.

Migration: Movement of animals from one place to another to get what they need to survive.

Oxygen: A gas found in air and water that animals need to breathe.

Pollen: Tiny grains found in flowers that must be moved from one part of the flower to another part of the flower for the plant to reproduce. Pollination is when the pollen is moved successfully and seeds are produced.

Predator: An animal who hunts and eats other animals.

Scales: Small hard plates that cover the skin of reptiles and some fish.

Senses: Different ways in which animals take in information about the environment, such as through sight or smell.

Spiracles: Tiny holes in an insect's body where oxygen enters so the insect can breathe.

Warm-blooded (Animal): An animal who can keep a constant body temperature, regardless of the temperature in the environment. Birds and mammals are warm-blooded.

Lesson 1

AMAZING ANIMAL ABILITIES

Students will explore different animal abilities like smelling with antennae and protecting babies through guarding, group safety, and making friends with Sea Anemones.

LESSON LENGTH

1 hour, 10 minutes

NGSS DISCIPLINARY CORE IDEAS

LS1.A: Structure and Function
LS1.B: Growth and Development of Organisms
LS1.C: Organization for Matter and Energy Flow in Organisms
LS3.A: Inheritance of Traits
ESS2.E: Biogeology
ESS3.C: Human Impacts on Earth Systems

Lesson 1

1. YOU AND THE ANIMAL KINGDOM

OVERVIEW

TIME

10 minutes

MATERIALS

Whiteboard or equivalent, dry erase markers.

INSTRUCTIONS

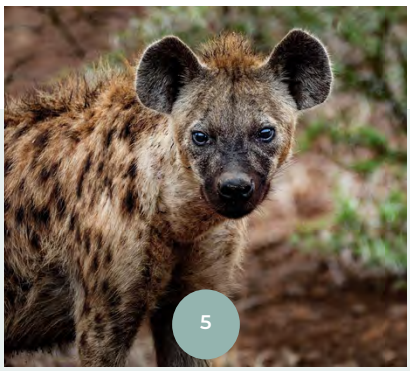
Invite students to share the name of an animal they have seen before. Organize the names on a whiteboard into one of six animal families (insects, birds, fish, mammals, reptiles, and amphibians) without labeling the families. Prompt students to add a name to any blank family.

DISCUSSION QUESTIONS

- What do all the animals in this group have in common [circle a group]?
- What is each family called? **Mammals, birds, insects, fish, reptiles, and amphibians.**
- Which animal family are humans part of? Add humans to the mammal list.
- What do all these animals need to stay alive? What special abilities help this animal [circle one animal] stay alive? **Choose another animal and repeat the latter question.**

FILM VIEWING PROMPT

As you watch the **Animal Kingdom** film, notice how each animal has a special ability that helps them stay alive, from smelling food with antennae to having waterproof feathers.



2. FOLLOW THE TRAIL

OVERVIEW

TIME

20 minutes.

MATERIALS

Outdoor chalk* x 1 piece per pair, craft sticks x 1 per student, markers x class set.

INSTRUCTIONS

Ask students how ants keep the environment clean. **They eat food scraps (plants and animals)**. Share that ants find food by smell. What do ants smell with? **Their antennae**. When an ant finds good food, they make a smelly trail for other ants to follow, so they can find the food too.

Students will write their name on a craft stick. Go to an outdoor paved play area and arrange students in pairs. Students are now ants looking for food scraps. The 'food' is their craft stick.

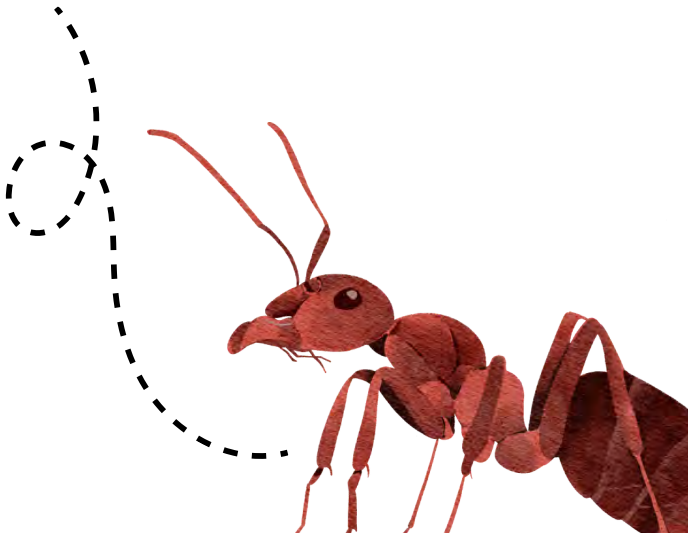
Round 1: Partner A closes their eyes while Partner B hides Partner A's stick. Partner A has 20 seconds to search for their stick. If they find it, they bring it back to Partner B. If they do not find it, they will come back empty handed. Note how many students found their stick.

Round 2: Hand out chalk to Partner B. Partner A will close their eyes again. If the stick was found in the first round, Partner B will re-hide the stick in a new location and draw a chalk line from the stick to Partner A. If the stick was not found, Partner B will go to the stick and draw a chalk line from the stick to Partner A. Partner A has 20 seconds to follow the chalk line, collect their stick, and bring it back to Partner B. Note how many students found their stick in 20 seconds.

*String could be used instead of chalk, or a stick could make lines in dirt or snow.

DISCUSSION QUESTIONS

- Why do animals need food? Did you find food faster with or without a trail? Why?
- How do ants change the environment? What would happen if there were no ants to eat food scraps? **Food scraps might pile up.**



3. KEEPING BABIES SAFE

OVERVIEW

TIME

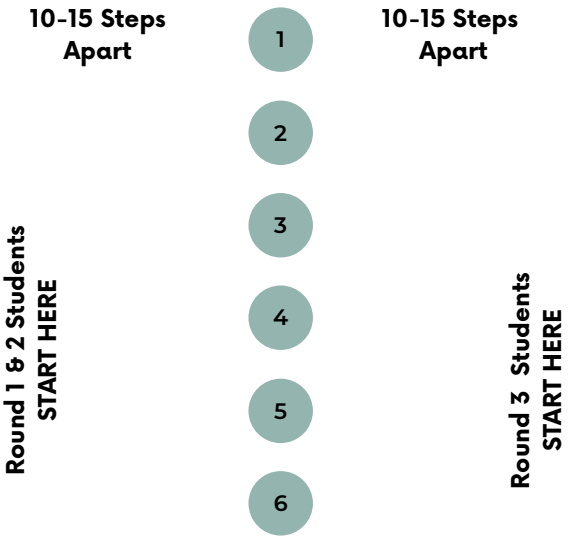
30 minutes

MATERIALS

Animal Kingdom Images (Appendix A), large plastic hoops x 6 (label the hoops 1-6), giant dice x 2.

INSTRUCTIONS

Show students the photos of each animal in **Appendix A**. In a large play area, set up a row of plastic hoops. Arrange students into pairs. One partner will be an adult animal and one will be an egg or baby. Pairs start by lining up about 10-15 steps away from the hoops, facing the hoops.



Round 1: Students are Clownfish. Adults (Partner A) will swim to a hoop with their egg (Partner B), drop the egg off in any hoop, and come back to the start zone. Share that some fish laid their egg next to a Sea Anemone and that egg is safe.

Some fish laid their egg next to coral they thought was an Anemone. Roll the dice. The eggs in all hoop numbers except the ones on the dice were laid next to an Anemone and are safe. The eggs in the hoop numbers on the dice are not safe and need to be moved. Adults of unsafe eggs will move their egg to an Anemone hoop and return to the start position. Reveal that all eggs are safe in Anemones and the Clownfish have hatched! Baby Clownfish can now swim back to the adults waiting in the start zone.

Round 2: Students are now King Penguins. Adults (Partner A) will turn away from the hoops. Babies (Partner B) will waddle to the hoops with their webbed feet, choose one to stand in, and start calling their adult's name. Without looking, adults will guess which hoop their baby is in by holding up the hoop number on their fingers. Adults will turn around. If they have guessed the number correctly, their baby is safe. If incorrect, their baby became lost and they will stand in the Round 3 start zone (see diagram). Tell the penguins that these babies need safety in numbers! The whole group will move to the lost babies and all babies are now safe again.

Round 3: Students are now Saltwater Crocodiles who move around on four scaley legs. Adults (Partner A) will curl up around their egg (Partner B). Share that the adults must hunt for a snack by crawling to a hoop of their choice. Roll the dice. Crocodiles in all hoop numbers except the ones on the dice found a snack quickly and can go back to their egg.

Crocodiles in the hoop numbers on the dice could not find a quick snack. While they were gone, a bird stole their egg! Eggs without an adult go to the side of the play area. Reveal that the game facilitator is the bird. If the crocodile (moving on all fours) can tag the bird within 20 seconds, they get their egg back. Once the crocodiles have tagged the bird and all eggs are guarded again, tell students that the eggs have hatched, and the babies are now safe in the water.

DISCUSSION QUESTIONS

- How are penguin babies like the adults? Why are babies stuck on land while adults can go in the water? **Babies do not have waterproof feathers, so they cannot swim.** How do adults find their baby? **Sound.** How do adults keep their babies safe? **Safety in numbers.**
- Why do Clownfish lay their eggs near Sea Anemones? **Clownfish have a slimy substance on their scales that protect them from the Anemone's sting. Other animals will get stung if they touch the Anemone, so the eggs are safe there.**
- How do Saltwater Crocodiles keep their eggs safe? **Guarding eggs**. If crocodiles are such a fierce **predator**, why would the babies need protection? **Babies are much smaller**.

4. CLOSING QUESTIONS

OVERVIEW

TIME

10 minutes

- Which animal family do you belong to? What are the five other animal families? Name one thing that animals from all families need to stay alive. **Possible responses: food, water, safety**.

- Which animal helps keep the environment clean? How could you keep the environment clean?
- How does an adult animal keep their baby safe? How do adults in your life keep you safe? When you next see an adult who keeps you safe, say thank you for taking such good care of you!

Why are Clownfish and Sea Anemones friends for life? Clownfish clean Sea Anemones in return for their protection.

Caring for the Kingdom

Earth's natural clean-up crew includes ants, vultures, hyenas, and more, but not everything left behind by other animals is safe for them to eat. Take for example plastic, which can get tangled around their body or accidently swallowed. Help our animal friends by picking up plastic litter and choosing items like toys, water bottles, and bags that are not made of plastic.

Lesson 2

AT HOME IN THE KINGDOM

Students will study animals living in various habitats and will participate in an active simulation to uncover the animal kingdom's best pollinators.

LESSON LENGTH

1 hour, 25 minutes

NGSS DISCIPLINARY CORE IDEAS

LS2.A: Interdependent Relationships in Ecosystems

LS4.D: Biodiversity and Humans

Lesson 2

1. YOU AND THE ANIMAL KINGDOM

OVERVIEW

TIME

30 minutes

MATERIALS

Who Is in this Habitat? Worksheet (Appendix B) x 1 per pair, clipboard x 1 per pair, pencil x 1 per pair.

INSTRUCTIONS

Introduce the six animal families and share a local example for each family (if possible). Ask students where they have seen these animals or know where these animals live in their neighborhood. Make a list of local **habitats** (i.e., urban, forest, wetland, grassland, etc.).

Take students outside to a local habitat. Arrange students in pairs and hand out the **Who Is in This Habitat? Worksheet**, a clipboard and a pencil to each pair. Pairs will fill in their worksheet.

DISCUSSION QUESTIONS

- Which animal family do humans belong to? **Mammals**. If you did not record the humans you saw in the habitat, add them to your worksheet now.
- Why were some animal families present in this habitat while others were not (if applicable)? Hint: Look at the top of the worksheet where you identified the temperature, how much water, and how many plants were present in the habitat. **Introduce the words warm-blooded and cold-blooded.**

FILM VIEWING PROMPT

As you watch the **Animal Kingdom** film, notice the diversity of animals that live in different land and water habitats around the world.

2. CAN YOU LIVE IN MY HABITAT?

OVERVIEW

TIME

20 minutes

MATERIALS

Can You Live in My Habitat? Art Sheet (Appendix C) x 1 per student, blank paper, drawing utensils.

INSTRUCTIONS

Hand out a **Can You Live in my Habitat? Art Sheet** and pencil to each student. Read the instructions on the sheet out loud, while student circle their answers.

On blank paper, students will draw the animal they chose on their art sheet and write their completed sentence from the sheet on their drawing.

Students will add "Can you live in my habitat?" after their sentence. Hang the artwork for the school community to see.

DISCUSSION QUESTIONS

- Which habitat types do you think humans can live in? Why do you think humans can live in almost any habitat?
- Which habitat(s) do you think have a greater variety of animals? Why might that be?

3. PICKING UP POLLEN

OVERVIEW

TIME

25 minutes

MATERIALS

Buckets or equivalent x 12, photo of an animal from each family (via web search), tape, small felt craft balls, yellow craft sticks or equivalent, Velcro tape cut and shaped into bracelets x 5, masking tape cut and shaped into bracelets with the sticky side out x 5, sock(s) cut into cuffs x 5, blank paper x 1 per student, ruler x 1 per student, writing utensil x 1 per student.

PART 1 INSTRUCTIONS

Explain that plants are an important part of many habitats, providing food, water, and shelter to animals who live there. While plants help animals survive, animals help plants survive by moving around seeds and pollen so the plants can continue to spread and grow. When animals drink nectar (sugary liquid in flowers), **pollen** can stick to them and move to different flower parts that help the flower reproduce. This is called **pollination**! Predict which animal families pollinate the most flowers and why.

Place a handful of craft sticks in six buckets and place the buckets at one end of the play area. Cover the sticks with felt balls (roughly 3-inch layer). Place six buckets at the other end of the play area. Tape a photo of an animal representing their animal family to each bucket.

Arrange students in the six animal families (4-5 students per group). Hand out one Velcro bracelet to each insect, one tape bracelet to each bird, and one sock cuff to each mammal to put on their wrist.

When the game facilitator says 'go', students will collect nectar (craft sticks) from flowers (first row of buckets with balls). They will drop off the nectar and any pollen (felt balls) stuck to them in the bucket with their animal family's photo (i.e., insects drop off nectar and pollen in the insect bucket).

Repeat for 2-3 minutes. Time permitting, consider having students switch animals so all have a turn to have pollen stuck to them.

PART 2 INSTRUCTIONS

Hand out a blank paper, a ruler and a writing utensil to each student. Students will create a pictograph with two columns (sample below), listing the six animal families in the first column and leaving the second column blank. Students will go to each animal family bucket and count the number of felt balls inside. On their pictograph, they will draw a flower next to the animal family for each felt ball in the bucket. Each ball represents a flower that was pollinated.

Animal Family	**For each flower pollinated, draw one flower in the space below next to the family who pollinated the flower.**
Fish	
Birds	
Insects	

DISCUSSION QUESTION

- Which animal family pollinated the most flowers? Why might that be? Does this match your original predictions? **Some insects who drink nectar or eat pollen have tiny hairs on their legs that collect pollen (like the Velcro). Birds who drink nectar get pollen stuck to their smooth beak (like the tape), and some mammals like bats who drink nectar get pollen stuck to their fur (like the sock cuff). While fish, reptiles and amphibians eat plants, they do not often pollinate flowers.**

Fish live in almost every marine habitat on the planet, from salt marshes in the United States to the Southern Ocean in Antarctica. While they are not pollinators, fish add nutrients to the ecosystem and can create important habitats for other water dwellers.[1]

4. CLOSING QUESTIONS

OVERVIEW

TIME

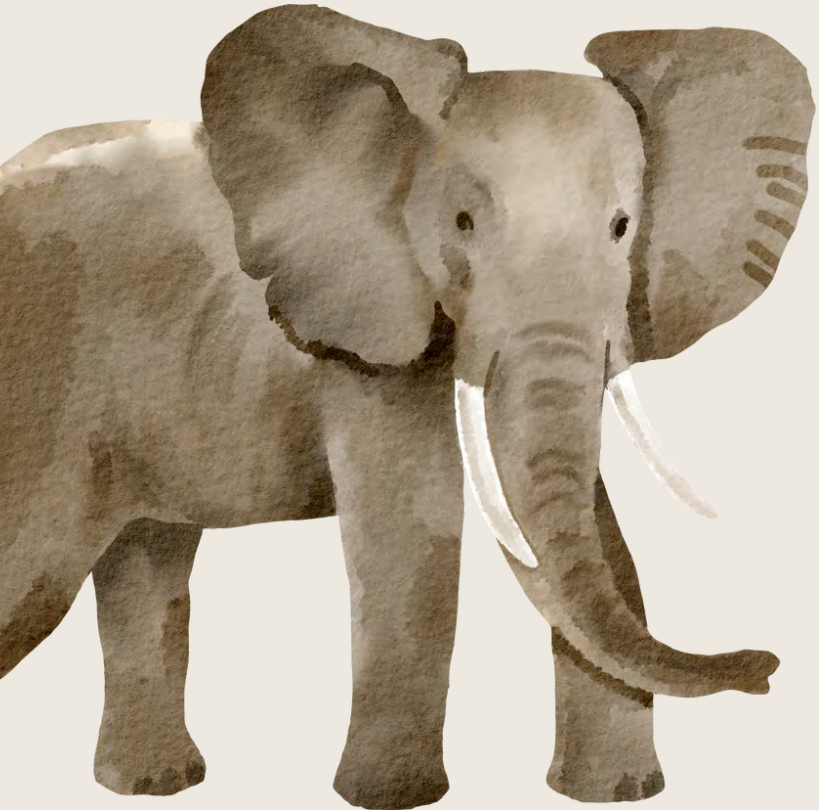
10 minutes

- Why can a penguin live in an ocean habitat but not in a desert habitat? Why can a snake live in a desert habitat but not in a tundra habitat? Why can humans – and other mammals – survive in so many different habitats?

- Why do plants need animals? Knowing that plants are a key part of many habitats, what could you do in your neighborhood to take better care of plants? Could you walk around plants instead of stepping on them? Could you leave flowers instead of picking them?

Caring for the Kingdom

Look at that bug! Thinking about catching them? Halt! Thinking about squishing them? Freeze! Insects are one of the world's best pollinators and they need to stay alive to do their important job. Instead of catching insects which can hurt their delicate bodies, take a photo or draw them in a journal. If a bug lands on you, gently brush them off or blow them away instead of harming them. Just like you, insects deserve to be treated with care.



Lesson 3

TOGETHER IN A CHANGING WORLD

Students will explore the impact of environmental changes on animals through a dramatic presentation and an active group game to save a penguin chick.

LESSON LENGTH

2 hours

NGSS DISCIPLINARY CORE IDEAS

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
LS2.D: Social Interactions and Group Behavior
LS4.C: Adaptation
LS4.D: Biodiversity and Humans

Lesson 3

1. YOU AND THE ANIMAL KINGDOM

OVERVIEW

TIME

45 minutes

MATERIALS

Blank paper x 1 per pair, writing utensils x 1 per pair, clipboards x 1 per pair, Changing Environment Cards (Appendix D), whiteboard or equivalent, dry erase markers.

PART 1 INSTRUCTIONS

In pairs, students will go outside with blank paper, a clipboard, and a writing utensil.

Students will draw three animals (if possible), three plants, and five parts of the environment (i.e., sun, rocks, water) that they find in the **habitat**.

DISCUSSION QUESTIONS

- For the animals you saw or know to be in this habitat, how do they interact with plants?
- What parts of the environment give them food, water, shelter, space, air, and warmth?

PART 2 INSTRUCTIONS

On a whiteboard, organize the animals seen outside in the six animal families. Add an animal to any blank family. Tell students there have been changes to the habitat and the animals need to respond to those changes.

Secretly assign Partner A a local animal. Partner B is a human. Give each pair a **Changing Environment Card** to read. Students will decide how they will respond to the changes as the animal and the human based on their needs of food, water, shelter, space, air, and warmth.

Example: There is a snowstorm in a usually warm habitat. A human will **adapt** and put on a heavy coat. An ant will freeze and won't survive.

One at a time, pairs will announce their scenario and act out their response to the change by describing what they are doing, without revealing what kind of animal they are. The class will guess who the human is and what kind of animal the partner is based on their responses.

DISCUSSION QUESTIONS

- What are some key adaptations that allowed the animals to survive the changes?
- Which animal family had the most survivors? Which had the least? Why?

FILM VIEWING PROMPT

As you watch the **Animal Kingdom** film, notice how animals survive changes to their environment, such as change in food availability or temperature. Do they leave, adapt, or perish?

2. HEALTHY SOIL, HAPPY ELEPHANTS

OVERVIEW

TIME

45 minutes

MATERIALS

Cue cards x 1 per pair, writing utensils, rulers x 1 per pair.

INSTRUCTIONS

Ask students what dung is. **The waste – or poop – of animals.** What do African Dung Beetles do with dung? **Bury it and eat it**. Burying dung changes the environment by adding nutrients to the soil, which helps plants grow. Which animals in the savannah need plants to survive?

Suppose an illness has made all the African Dung Beetles sick and they can no longer roll and bury dung. Soil quality has decreased and plants have stopped growing in the area.

The class is an elephant herd that needs plants to eat. The herd has gathered to decide how to respond to this problem. In pairs, students will come up with a response taking the perspective of an elephant, write it on a cue card, and present the following to the herd: a description of their solution, a reason why the solution could work, and a possible challenge with the solution.

Once all responses have been voiced, the herd will vote on the solution they think is best, based on the physical characteristics and needs of elephants. Compare the solution chosen by the herd with the actual solution used by elephants when food is not available: **migration**.

DISCUSSION QUESTIONS

- Why is long distance migration to find food a good solution for an animal like an elephant, but less good for an animal like a toad?
- Which other animals migrate to find food (recall from the **Animal Kingdom** film)? **Insects, birds, and fish**.

3. PROTECTING PENGUINS

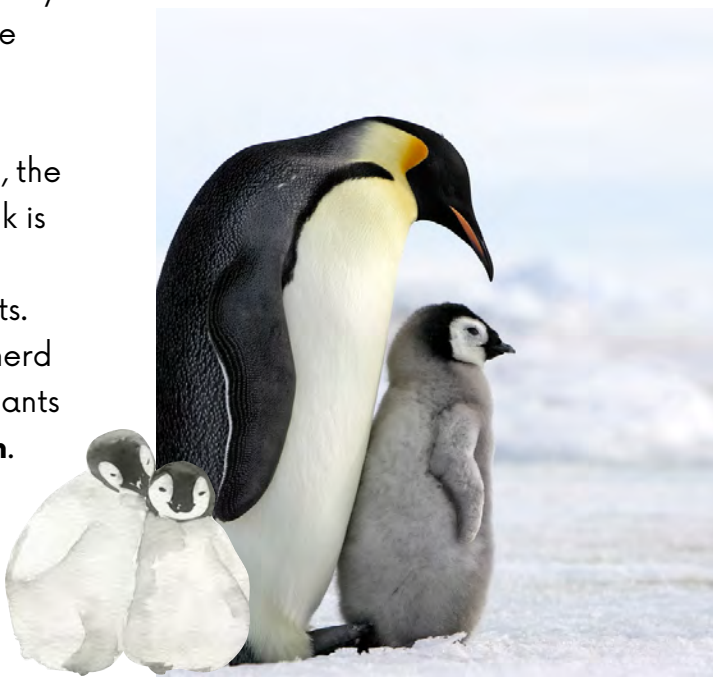
OVERVIEW

TIME

20 minutes

MATERIALS

Baby penguin stuffie, photo of a skua (via web search), a long rope.



INSTRUCTIONS

Share that while elephants live in small family groups, penguins live together in the thousands. In a large open play area, place a rope in a huge circle with a penguin stuffie in the middle. Show students photo of a Skua and assign one student to be a Skua – a bird who eats penguin chicks. Some students will be King Penguins and some will be Elephant Seals.

Penguins will stand along the outside edge of the rope. They can move along the rope but cannot step inside it and cannot move more than one step away from the rope. Before the round starts, penguins will close their eyes. The Skua will choose a position ten steps away from the rope to start. When the round begins, the Skua will have 30 seconds to move inside the rope and catch the chick without getting tagged by the penguin(s). The round ends if the Skua is tagged by the penguin, the 30 seconds runs out, or if the Skua catches the chick.

Round 1: One penguin will stand along the rope. The Skua will have 30 seconds to catch the penguin chick without getting tagged by the penguin. Remaining penguins will be eating fish in the ocean, unable to help the penguin on land.

Round 2: Ten penguins will stand along the rope. Assign three students to be Elephant Seals. They will lay outside the rope as 'obstacles' that the Skua must go around. The Skua will have 30 seconds to catch the penguin chick without getting tagged by the penguins. Remaining penguins will be eating fish in the ocean, unable to help the penguins on land.

Round 3: Twenty penguins will stand along the rope. Assign remaining students to be Elephant Seals. The Skua will have 30 seconds to catch the chick without getting tagged by the penguins.

If time permits, repeat the game with a different student playing the Skua.

DISCUSSION QUESTIONS

- Was the penguin chick safer when there were more penguins or fewer penguins around the rope? Why might that be? What are other benefits to living in a group?
- When the environment changes – for example a predator appears – the group works together to stay safe. What other environmental changes might impact penguins? How might they respond?

4. CLOSING QUESTIONS

OVERVIEW

TIME

10 minutes

- Which adaptations help animals survive in a changing environment? How do you change the environment? Are these changes helping any animals – including humans – survive?
- Why is living in a group helpful for some animals? Knowing that many humans live in groups, think of an action – like using kind words, standing up to bullies, etc. – that you can take in the next week to play a role in group wellbeing.

In an elephant herd, the oldest and wisest female or matriarch makes all the decisions on where the group will go and what the group will do if there is a change in their environment.

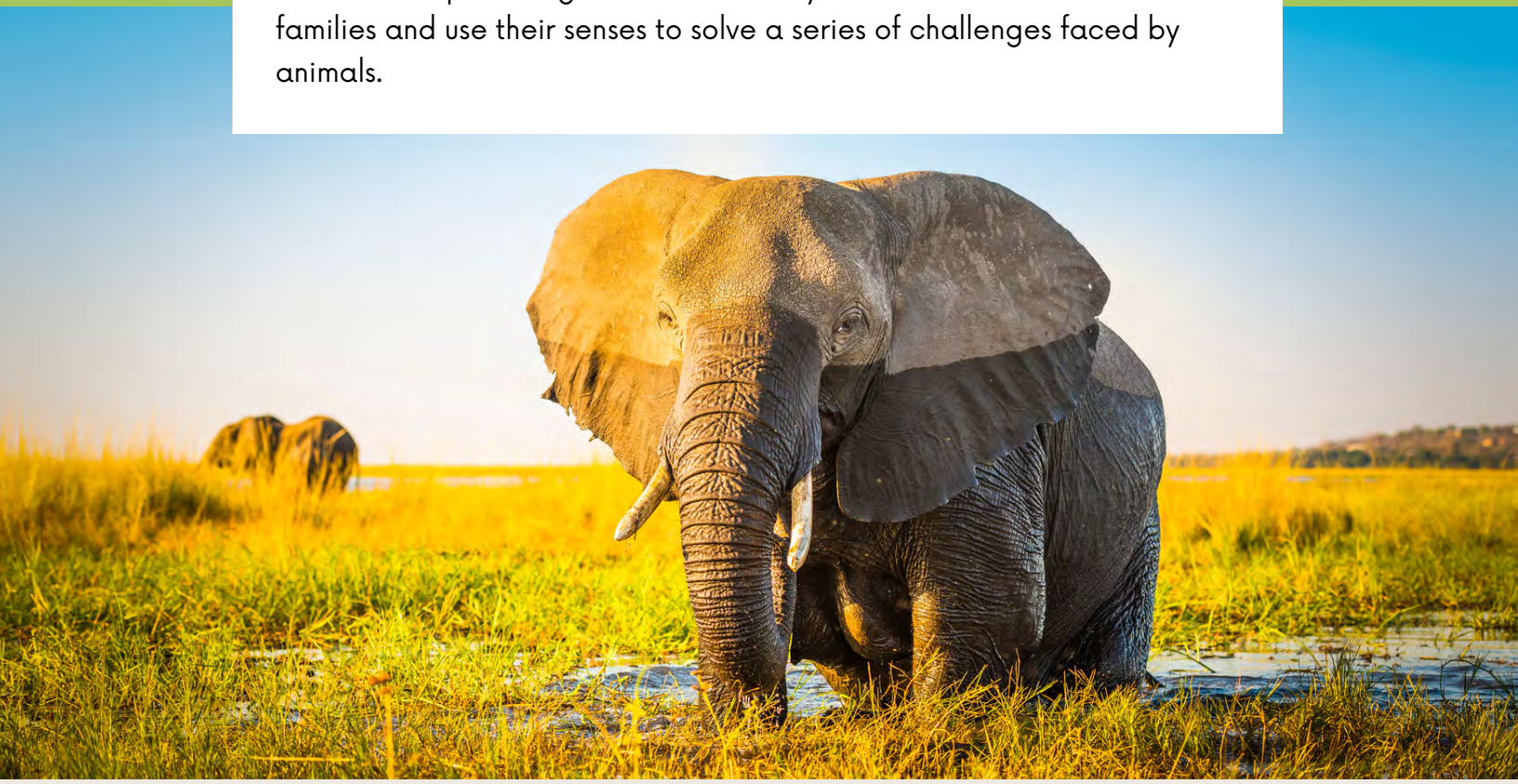
Caring for the Kingdom

Humans often change the environment, but not always in a way that is helpful to other animals. Channel your inner African Dung Beetle and make a positive change! Set up a compost bin in your community to toss your food scraps and make nutrient-rich soil. Use that soil to grow local vegetables to share with your neighbors or grow local wildflowers that will create a habitat for wild animals with food, water, shelter, space, air, and warmth.

Lesson 4

CELEBRATING EVERY BODY

Students will piece together the anatomy of animals in the six animal families and use their senses to solve a series of challenges faced by animals.



LESSON LENGTH

1 hour, 40 minutes

NGSS DISCIPLINARY CORE IDEAS

LS1.A: Structure and Function

LS1.D: Information Processing

Lesson 4

1. YOU AND THE ANIMAL KINGDOM

OVERVIEW

TIME

30 minutes

MATERIALS

Blank paper x 1 per pair, clipboards x 1 per pair, writing utensils x 1 per pair.

INSTRUCTIONS

As a class, brainstorm different **internal** and **external** structures of humans. Arrange students in pairs and give each pair blank paper and writing utensils. Partner A will draw the outline of a human body on the right side of the sheet.

Partner B will write the following in a column on the left side of the sheet: **Drinking Water, Eating Food, Moving Around an Object, Making a Shelter, Warming Up, and Breathing**. Partner A will pretend to do the activities listed on the sheet (or do the activities when possible), while Partner B fills in the human body with internal and external structures (i.e., heart, lungs, hands, feet, etc.) used to complete the activity. Partner B will draw a line connecting the body parts used in the activity to the activity name.

In pairs, go outside with a clipboard, writing utensil and the human body sheet. On the back of the human body sheet, Partner B will draw an observed animal* on the right side of the sheet and Partner A will duplicate the column from the human body side on the left side of the sheet.

*Note: If students cannot find any animals outside, show them videos of local animals to complete the second side of the worksheet.

While watching the animal, students will fill in the body with internal and external structures, and draw a line connecting the body parts used to complete the activity to the activity name.

DISCUSSION QUESTIONS

- Compare how the humans completed their activities with how the other animals completed their activities. Were similar structures used to complete similar tasks?
- In which activities were **senses** used – sight, hearing, taste, touch, or smell?

FILM VIEWING PROMPT

As you watch the **Animal Kingdom** film, notice the bodies of animals in the six families. How are they moving? How are they eating and drinking? How are they using their senses?

2. PUZZLING ANIMALS

OVERVIEW

TIME

30 minutes.

MATERIALS

Animal Family Puzzles (Appendix E) cut into puzzle pieces.

INSTRUCTIONS

In a large open play area, arrange the class into the six animal family groups. Give each group <u>one</u> puzzle piece of an animal from their family (**Appendix E**). Mix up and spread the remaining pieces from all families at the far end of the play area.

When the game begins, a student from each group will go to the far end of the play area, get a puzzle piece of their animal (color side up), and bring it back to the group. While the group decides where the piece goes, a different group member will get another puzzle piece and bring it back, in a relay style. Repeat until all pieces are found and the puzzles are complete. If a group has a piece that does not belong to their animal, they will return it to the correct group.

DISCUSSION QUESTIONS

- How many internal and external body parts of the animal can you name? Check the back of the piece to see a partial list and compare your answers.
- Give an example of internal and external structures working together.
- Remove 1-2 puzzle pieces. What was the function of the body part(s) removed? Could the animal survive without this body part? Why?
- How could an animal lose an internal or external structure?

3. MAKING SENSE OF SENSES

OVERVIEW

TIME

30 minutes

MATERIALS

Making Sense Station Cards (Appendix F), small sponges x 3, mint extract, orange extract, small cardboard boxes (or equivalent) x 3, orange x 1, pylon x 3, large felt circles x 8, water, rocks (optional), noise-cancelling headphones x 2, blank paper x 1 per student, drawing utensils.

INSTRUCTIONS

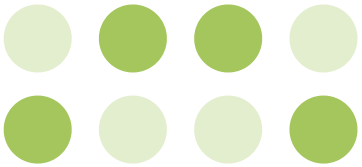
In advance, set up the following six stations in an outdoor space and arrange students in pairs:

Station 1 - INSECT / Ant: Soak one small sponge in mint extract, one in orange extract, and leave one sponge with no scent. Mark the orange sponge with the letter 'O'. Place the sponges next to a pylon. Place three carboard boxes five steps away from the pylon in a row, facing down. Place an orange under <u>one</u> of the boxes. Make a trail of orange extract from the box with the orange to the pylon. Make a trail of mint extract from a box without the orange to the pylon.

Station 2 - BIRD / King Penguin: Place one pylon in the play area and the second pylon approximately ten steps away.

Station 3 - REPTILE / Snake: Place the noise cancelling headphones on the ground.

Station 4 - AMPHIBIAN / Frog: Place felt circles in four rows with two circles in each row. Circles should be 4-5 steps apart. Place a pylon at the far end of the rows. Soak one felt circle in each row with water. Consider putting rocks on top of the circles to weigh them down if needed.



PYLON

Station 5 & 6 - MAMMAL / Whale & FISH / Clownfish: No set up required.

Pairs will go to each station and complete the tasks listed on the **Making Sense Station Cards.**

DISCUSSION QUESTIONS

- In what ways do you use your senses like the other animals at the stations? For example, do your sense of smell to find food?

- In which activities did you need to use your memory to complete the task? **Penguin – remembering the call with their baby, Whale – remembering the song to teach others, Frog – remembering which circles were damp. Share that many animals use their memories to guide their actions. Elephants have especially good memories and can recall safe paths, favourite mud baths, and the best places for the herd to feed.**
- Which body part processes the information taken in through your senses? **Your brain!**

A humpback whale's brain weighs up to a tonne. This huge and heavy internal structure has allowed them to develop their own unique language using grunts, clicks, and whistles.

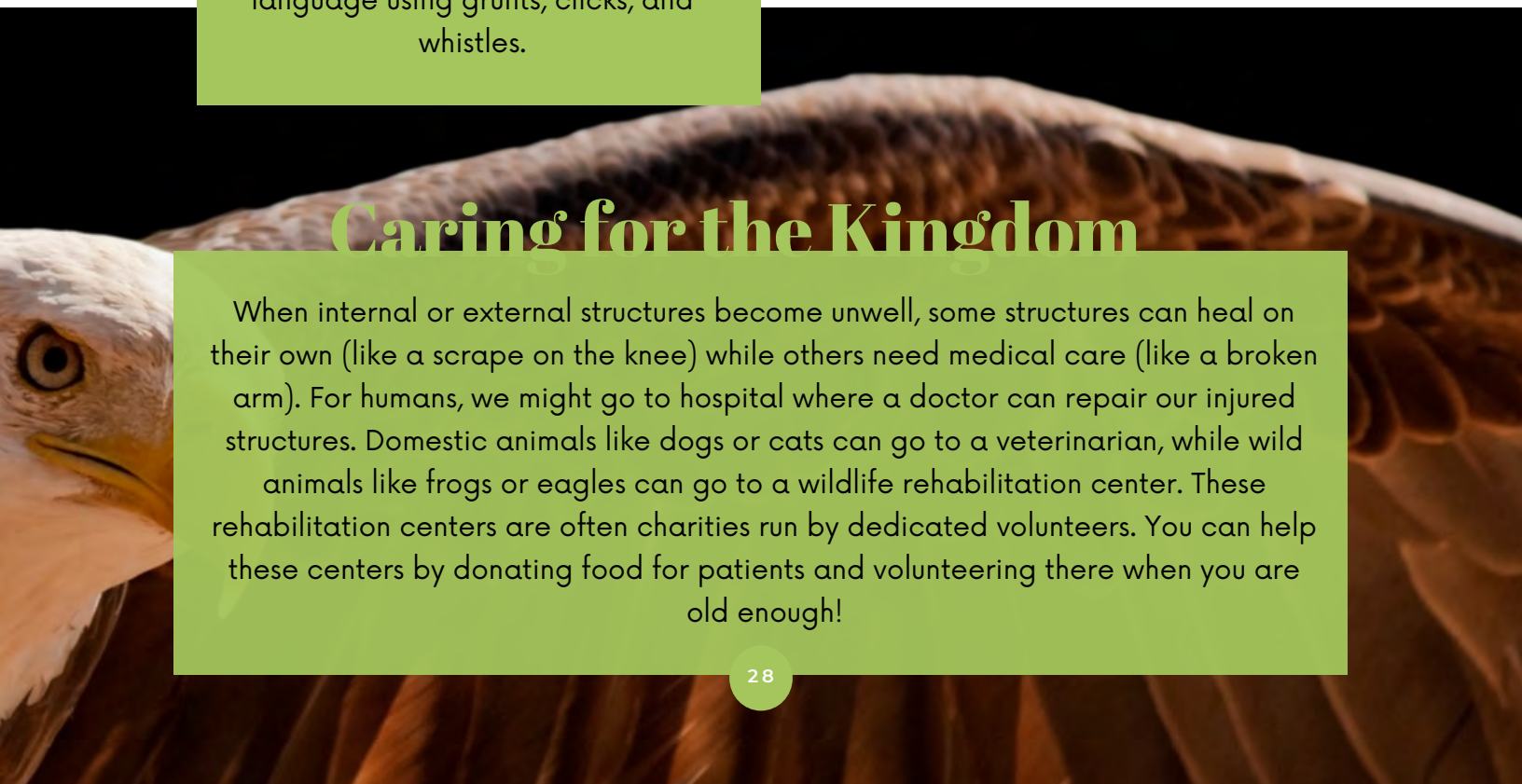
4. CLOSING QUESTIONS

OVERVIEW

TIME

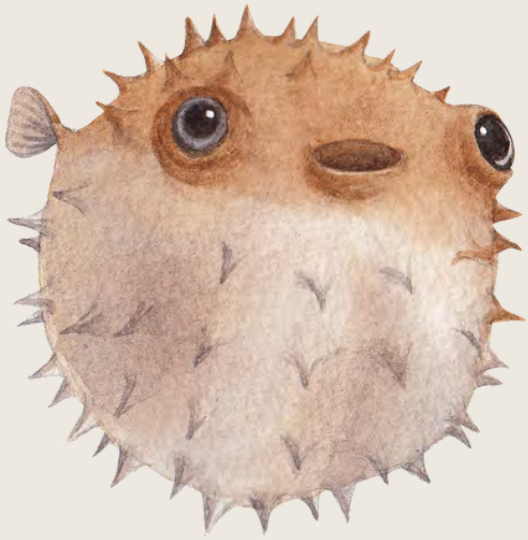
10 minutes

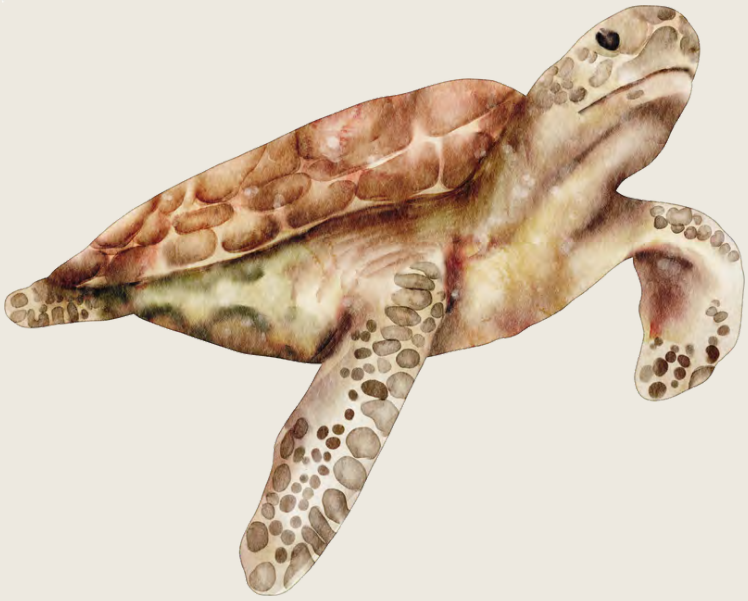
- Why it is important for animals to take care of the internal and external structures of their body? What can happen if an animal loses a body part?
- In recognizing how important every part of animal bodies are, name one action you can take to better care for – and celebrate – your own body? For example, what might protect your ears if you are in a loud space? What might protect your skin if it is sunny?

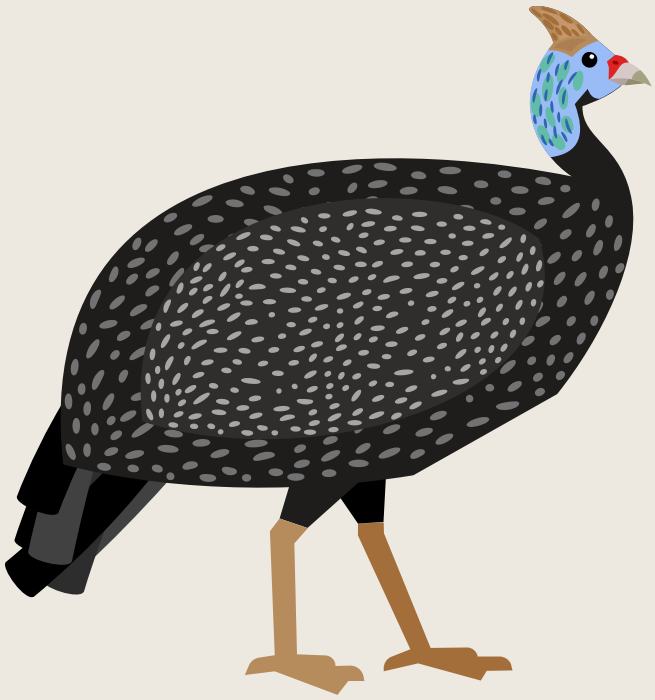


Caring for the Kingdom

When internal or external structures become unwell, some structures can heal on their own (like a scrape on the knee) while others need medical care (like a broken arm). For humans, we might go to hospital where a doctor can repair our injured structures. Domestic animals like dogs or cats can go to a veterinarian, while wild animals like frogs or eagles can go to a wildlife rehabilitation center. These rehabilitation centers are often charities run by dedicated volunteers. You can help these centers by donating food for patients and volunteering there when you are old enough!







Lesson 5

ANIMALS AND ECOSYSTEMS

Students will learn how energy and matter moves among animals, using food diaries, a demonstration of gills, and a multi-part food web simulation.

LESSON LENGTH

3 hours

NGSS DISCIPLINARY CORE IDEAS

LS1.C: Organization for Matter and Energy Flow in Organisms

LS2.A: Interdependent Relationships in Ecosystems

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems.

Lesson 5

1. YOU AND THE ANIMAL KINGDOM

OVERVIEW

TIME

40 minutes

MATERIALS

Blank paper x 1 per student plus 1 per pair, drawing utensils, clipboard x 1 per pair.

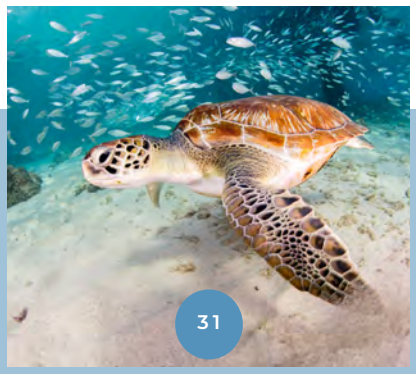
INSTRUCTIONS

Share with students that animals get **energy** from food. On blank paper, students will make a timeline of the food they ate yesterday and indicate whether the food was from plants or animals.

Below the food, students will write or draw the activities they did throughout the day.

As a class, make a list of local animals from the six animal families. Include at least one **decomposer**. Identify whether the animal eats plants, animals, or both. Take students outside and arrange in pairs. Using paper, a writing utensil, and a clipboard, students will make a list (text or drawing) of food sources they see in the area.

On the back of their personal timeline, they will create a timeline showing all the food a local animal of their choice might eat in a day and all the activities the animal might need energy for. Students may wish to research the diet of the animal to complete their timeline.

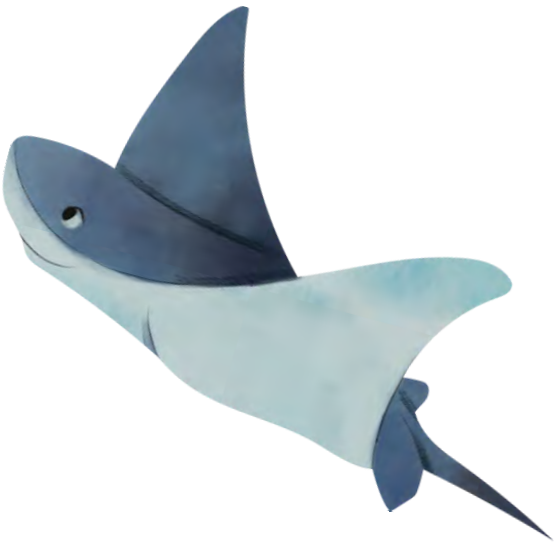


DISCUSSION QUESTIONS

- For students and animals who ate other animals, how did the animals eaten get their energy? **By eating other animals or plants**. How did the plants get energy? **The sun**.
- Did you include growing, healing (body repair) or keeping the body at a steady temperature on both timelines? **These daily activities require energy from food too**.
- Do any animals need energy for the same activities as you?
- Is there enough food in your area for all animals to get the energy they need? Why?
- In addition to food, what else do animals need from their environment to survive?

FILM VIEWING PROMPT

As you watch the **Animal Kingdom** film, notice how animals in the six families get energy from living beings and get oxygen from their environment.



2. TAKING A BREATH

OVERVIEW

TIME

40 minutes

MATERIALS

Clear cups x 2 per pair, coffee filter x 1 per pair, can strainer x 1 per pair, small sieve x 1 per pair, water, Making Gills Worksheet (Appendix G), writing utensils, sand, rice, poppy seeds (or equivalent depending on food allergies).

INSTRUCTIONS

Share that plants breathe in carbon dioxide and breathe out **oxygen**, while animals do the opposite. Mammals, reptiles, some amphibians, and birds take in oxygen through **lungs**. Insects have **spiracles** and fish take in oxygen through **gills**. In pairs, students will gather the materials on the **Making Gills Worksheet** and follow the instructions to recreate gills.

DISCUSSION QUESTIONS

- How do gills make sure oxygen from water gets into the body, while keeping debris out? **Gills are like a filter. They catch oxygen and let debris flow back into the water**.
- How do you think animals living in the water with lungs – like whales – get oxygen? **Come to the surface and breathe through nostrils on their head (called blowholes)**.

3. BUILDING AN ECOSYSTEM

OVERVIEW

TIME

1 hour, 30 minutes

MATERIALS

2-inch wooden rectangle blocks x 180, markers, pencil crayons, chart paper, dice x 8.

PART 1 INSTRUCTIONS

Arrange students in groups of four and assign each group a **habitat**: ocean, forest, savannah, tundra, desert, or wetland. Hand out six blocks to each student.

On each side they will write:

Side 1: An animal who lives in the habitat (allow library research if needed). **Animals from at least three different families must be represented. Animals may be repeated in the group.**

Side 2: Who the animal eats to gain energy (plants and/or animals).

Side 3: What the animal uses the energy for.

Side 4: Whether the animal breathes with gills, lungs, or through the skin.

Groups will sketch their habitat on chart paper and place their blocks on top (animal names face up). Groups will make a **food web** by drawing more plants and animals including decomposers and adding lines connecting the animals to the food they eat. Finish with arrows showing the flow of oxygen and carbon dioxide between plants and animals, or between water and animals.

DISCUSSION QUESTIONS

- Do most animals eat a variety of food to gain energy or just one type of food? Why?
- How are animals getting oxygen in this habitat?
- What might happen to the food web if you introduced a new species?

PART 2 INSTRUCTIONS

Two groups will join to make an ecosystem. Students will stack their blocks, having three blocks per row and alternating the orientation of each row. Using a die, they will play the game below.

Roll a 1: Air quality has decreased due to pollution and one species has perished. Remove an animal from the stack, flip the block to the food they eat and add the block to the top of the stack.

Roll a 2: Students raised money to protect a habitat. No further action is required.

Roll a 3: Overfishing and over hunting by humans has caused a species to perish. Remove an animal eaten by humans from the stack, flip the block to the food they eat and add the block to the top of the stack.

Roll a 4: A warming climate has dried up water sources, causing two species to perish. Remove two animals from the stack, flip the block to the food they eat and add the block to the top of the stack.

Roll a 5: Students have committed to buying used items, saving thousands of habitats from being destroyed for metals and other materials needed for new items. All species are thriving. No further action is required.

Roll a 6: Wildfires have increased with the warming climate, destroying the habitat of two species. Remove two animals from the stack, flip the block to the food they eat and add the block to the top of the stack.

Continue playing until the stack of blocks falls over.

DISCUSSION QUESTIONS

- What happened to the ecosystem when an animal was removed?
- What might happen if there were too many of a certain animal in an ecosystem? How could the ecosystem become balanced again?
- How could the disappearance of an animal in the ocean impact an animal in a forest?

4. CLOSING QUESTIONS

OVERVIEW

TIME

10 minutes

- Why do animals need food? **Energy**. What do animals need to survive that is present in air and water? **Oxygen**. Name three ways animals get oxygen into their body. **Lungs, gills, and skin**.
- What could you do to make sure an ecosystem stays balanced, where each animal is getting what they need to survive such as food and oxygen?

Insects number in the quintillions. Birds play a key role in keeping insect populations balanced by eating 20 quadrillion bugs every year.

Caring for the Kingdom

Humans take animals out of the ecosystem for food, clothing, entertainment, and more. When humans take too much, ecosystems become unbalanced. You can help the global ecosystem stay in balance by choosing items that are not made from animals nor tested on animals. You can also choose pets or entertainment that does not depend on holding wild animals captive.

Credits

Animal Kingdom is produced by Definition Films, and distributed by K2 Studios in Giant Screen and IMAX® theaters at science centers, museums, aquaria and specialty theaters worldwide.

Written by Back to Earth Science Inc. | backtoearthscience.com

Graphic design by Mireia Villalonga

Back to Earth Science Inc. is located on the traditional territory of the Anishinaabek and Haudenosaunee. K2 Studios is situated within the traditional territory of the Gabrielino/Tongva Nation.

Learn more about **Animal Kingdom: A Tale of Six Families**, a giant screen format film at www.theanimalkingdomfilm.com.

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APPENDIX

APPENDIX A – ANIMAL KINGDOM IMAGES

APPENDIX

APPENDIX B – WHO IS IN THIS HABITAT? WORKSHEET

Date

Amount of Plants (circle)

None | A few | Some | Many

Amount of Water (circle)

None | A Little | Some | A lot

Temperature (circle)

Hot | Cold

Habitat Type (circle)

FOREST	URBAN	MEADOW
TUNDRA	OCEAN	WETLAND
SAVANNAH	DESERT	OTHER

APPENDIX

APPENDIX B – WHO IS IN THIS HABITAT? WORKSHEET

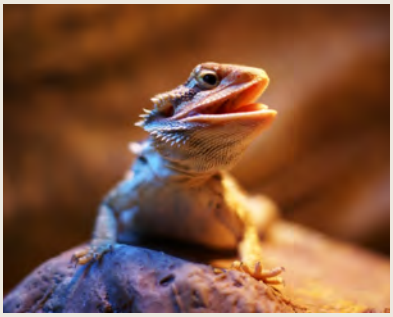
FAMILY	ANIMALS OBSERVED IN THE HABITAT (draw or write in the space below)
Mammals	
Insects	
Reptiles	
Amphibians	
Fish	
Birds	

APPENDIX

APPENDIX C – CAN YOU LIVE IN MY HABITAT? ART SHEET

Circle one animal from the list below.



Which family does the animal you circled belong to? Circle your answer.

Mammal Bird Reptile Amphibian Fish Insect

What kind of habitat can this animal live in? Circle your answer.

Water Snow (Tundra) Heat (Desert)

How does this animal survive in their habitat? Circle your answer.

I am warm-blooded and have thick blubber.

I can breathe through my moist skin.

My wings are like flippers.

The hot sun warms up my cold-blooded body.

I have gills that let me breathe underwater.

My scales keep water in my body, so I do not dry out.

APPENDIX

APPENDIX C – CAN YOU LIVE IN MY HABITAT? ART SHEET

Complete the sentence below to describe the animal.

I am a _____ (animal name)**, I belong to the**_____

(animal family name) **family. I can live in**_____(habitat type)

because _____ (how the animal survives).

Complete sentences:

- I am an Elephant Seal. I belong to the mammal family. I can live in the snow because I am warm-blooded and have thick blubber.
- I am a Whale Shark. I belong to the fish family. I can live in water because I have gills that let me breathe underwater.
- I am a Lizard. I belong to the reptile family. I can live in heat because my scales keep water in my body, so I don't dry out.
- I am a king penguin. I belong to the bird family. I can live in water because my wings are like flippers.
- I am an African Dung Beetle. I belong to the insect family. I can live in heat because the hot sun warms up my cold-blooded body.
- I am a frog. I belong to the amphibian family. I can live in water because I can breathe through my moist skin.

APPENDIX

APPENDIX D – CHANGING ENVIRONMENT CARDS (PAGE 1 OF 2)

The only wild berry picking spot in this habitat has turned into a parking lot.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive with this change? If yes, what action must you make to survive?

Pollutants from a factory spilled into a stream. The water is no longer safe to drink or swim in.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

A sudden flood has washed away the food you had been storing for the season.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

A tornado has destroyed the best hiding place in your habitat.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

With no rain for months, the fresh water source in your habitat has dried up.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

The trees in your habitat were cut down to build houses. It is hot out and you have no shade.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

APPENDIX

APPENDIX D – CHANGING ENVIRONMENT CARDS (PAGE 2 0F 2)

A disease has wiped out pollinators. Fruit, seeds, and nuts are no longer in your habitat.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

An invasive biting insect has swarmed your habitat. The swarm is so thick, you cannot see.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

Wildfire smoke is drifting into your habitat. The air quality is poor.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

An ice storm has covered the ground, trees, and water in your habitat with a thick layer of ice.

What need is impacted (food, water, shelter, space, air, warmth)?
Can you survive this change? If yes, what action must you make to survive?

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 1 OF 6)

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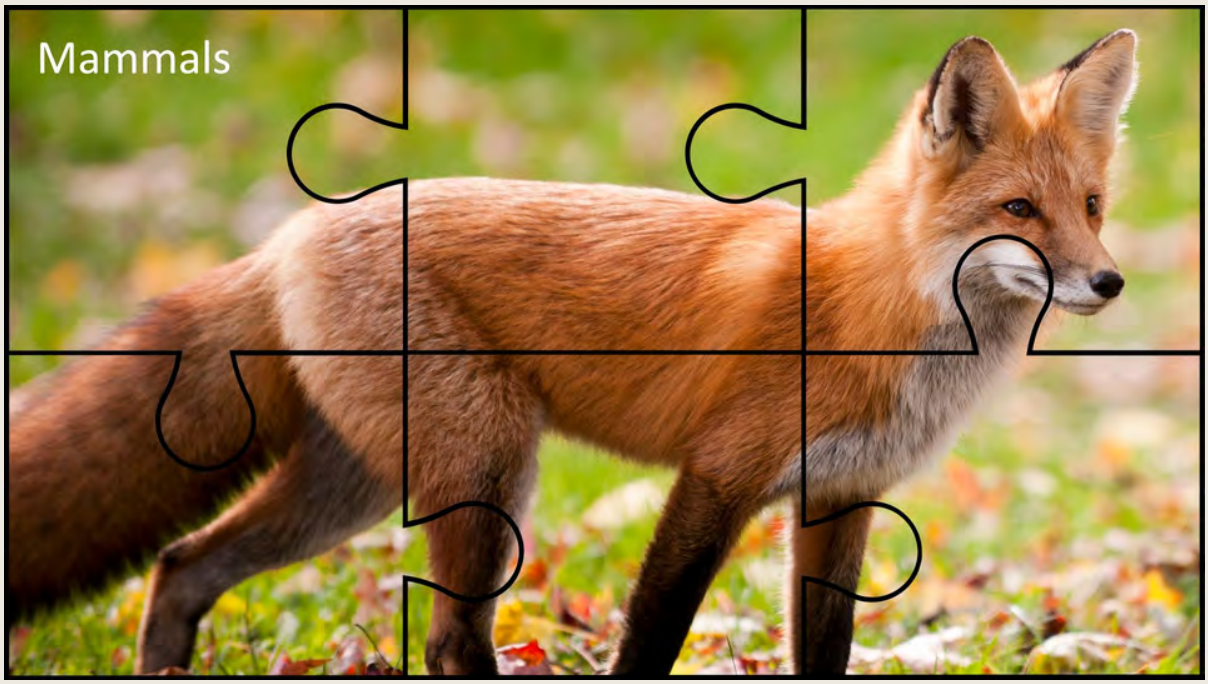

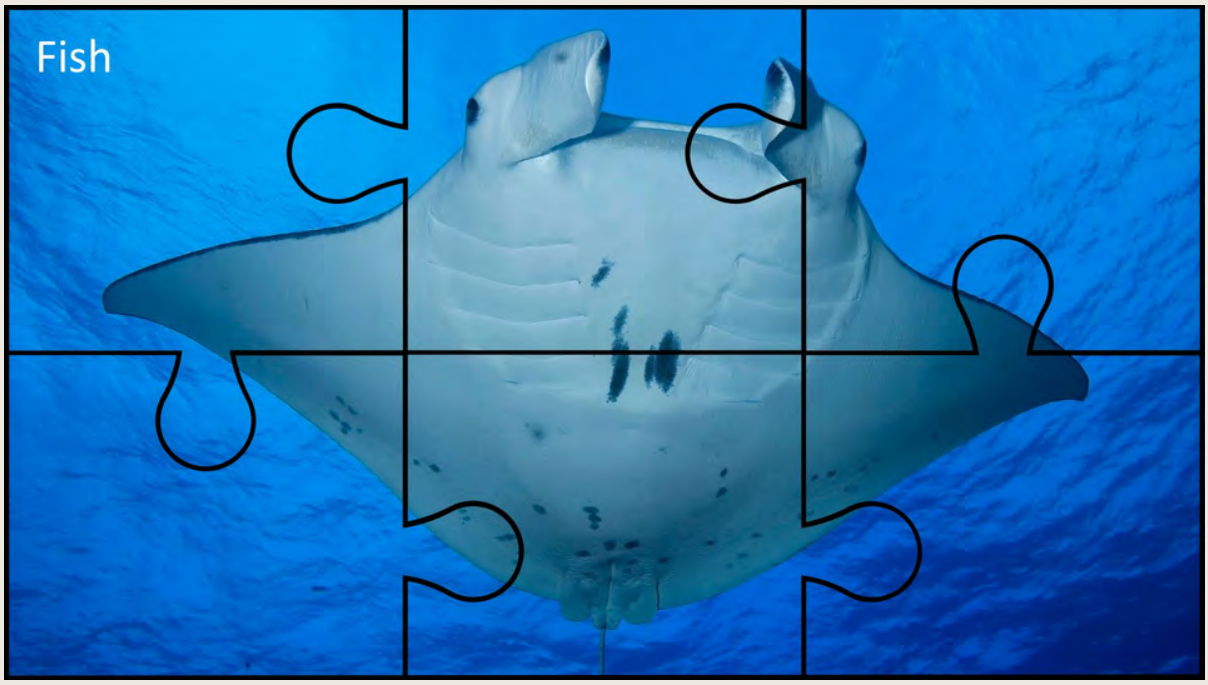

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 2 OF 6)

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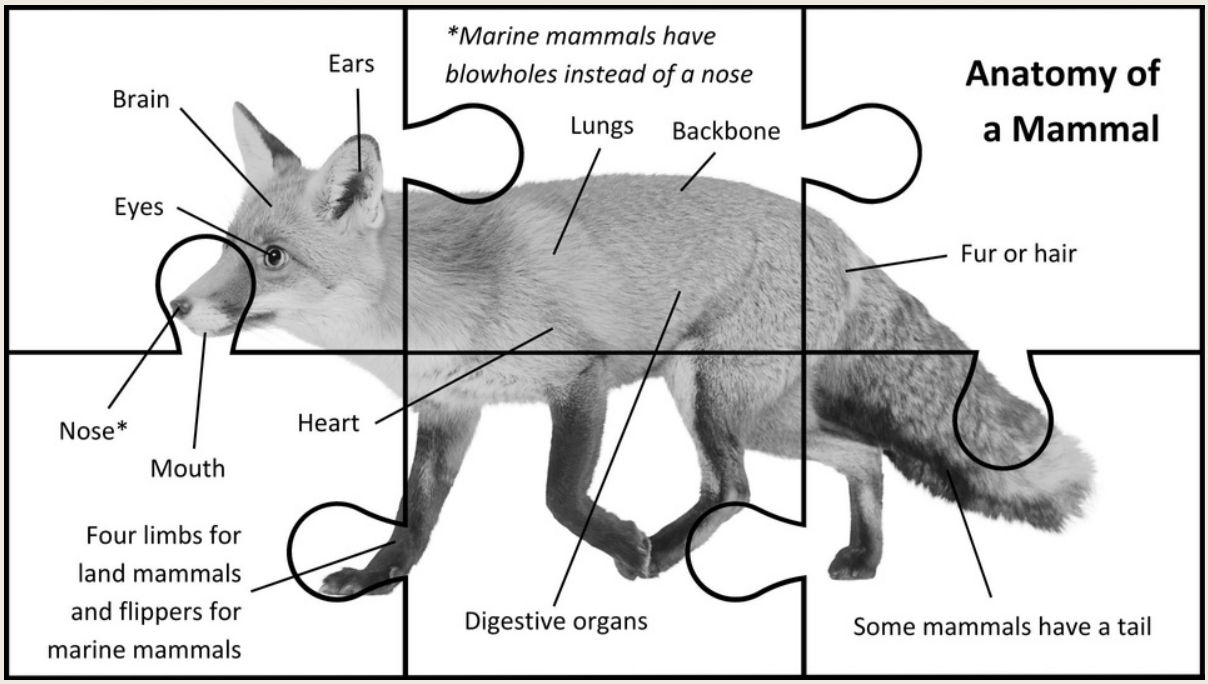

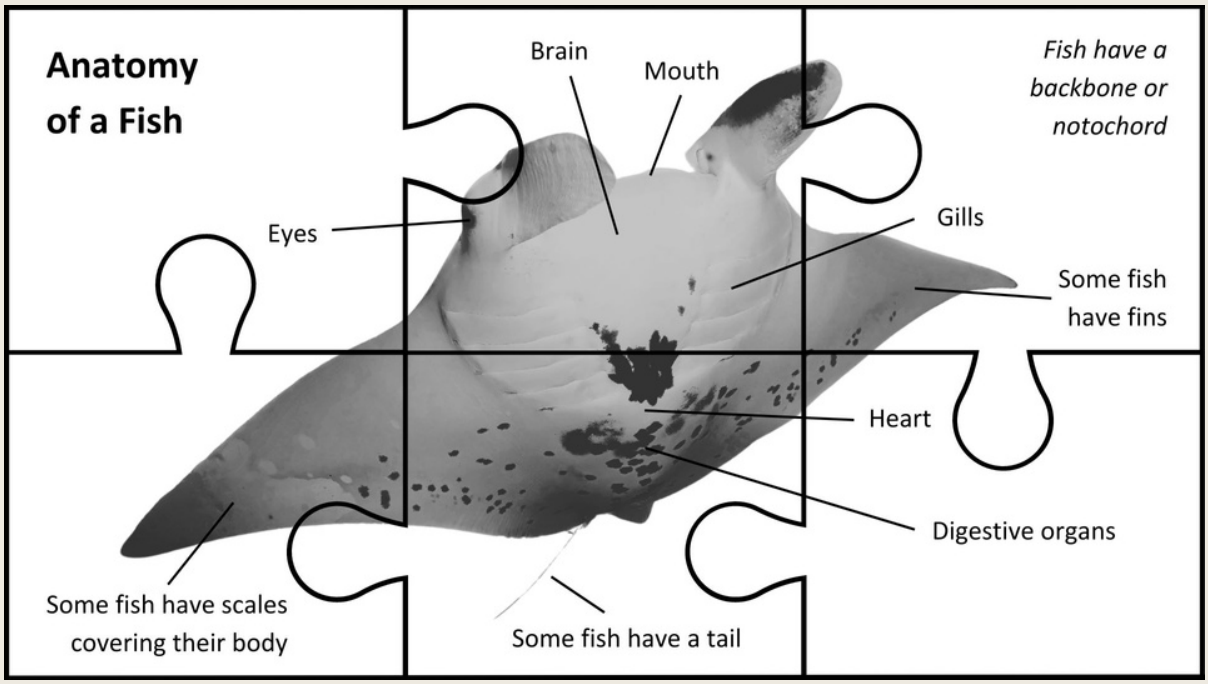

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 3 OF 6)

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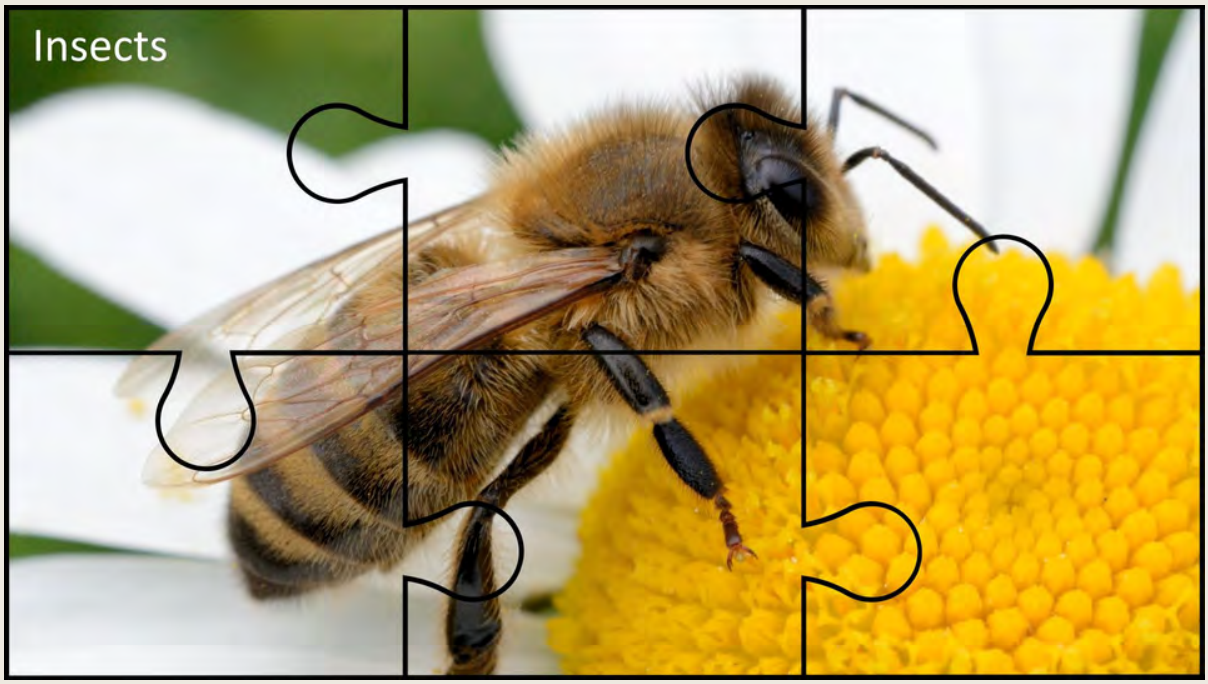

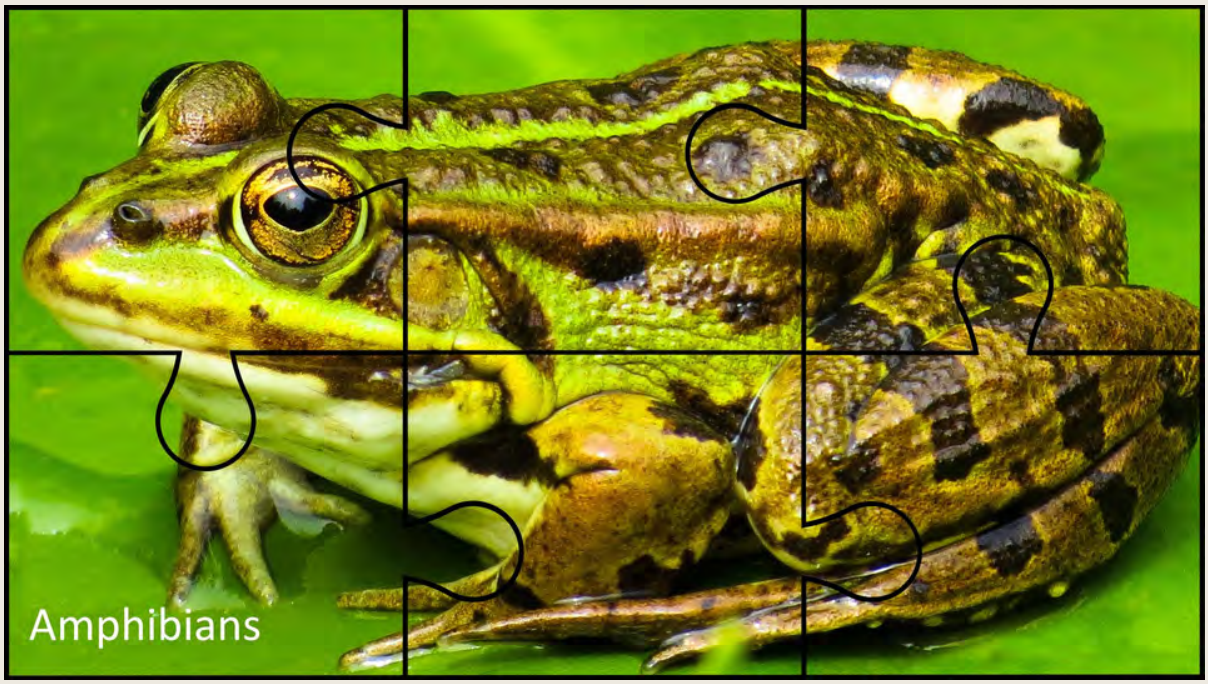

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 4 OF 6)

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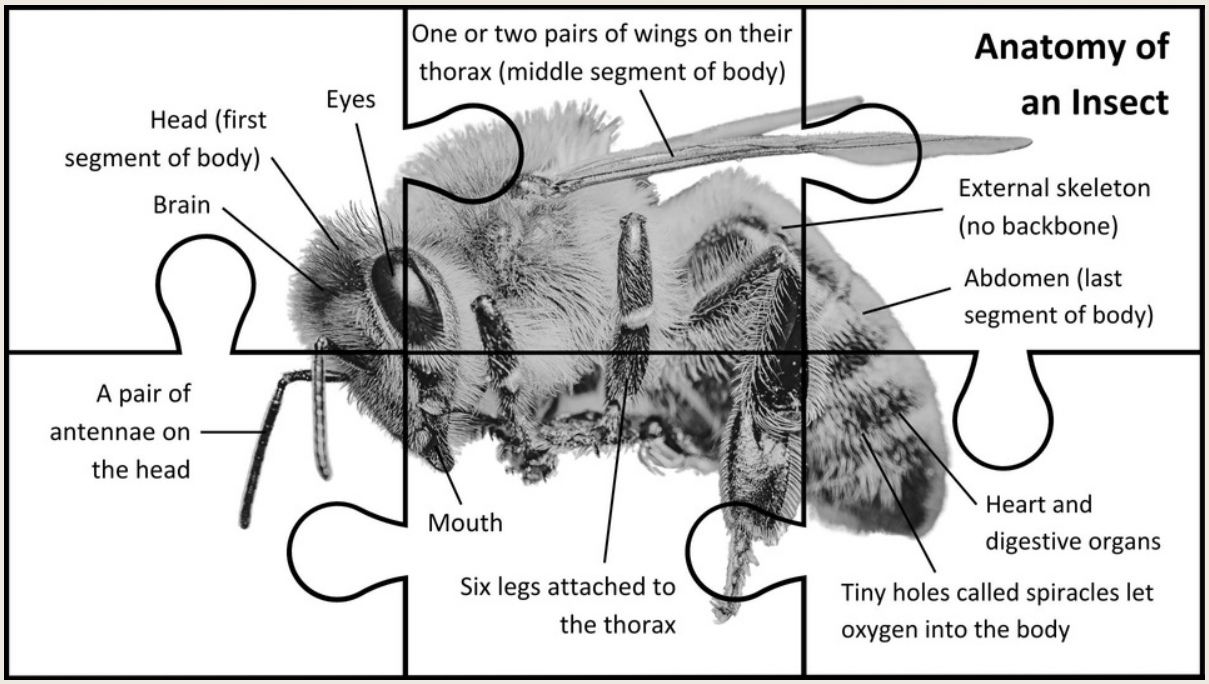

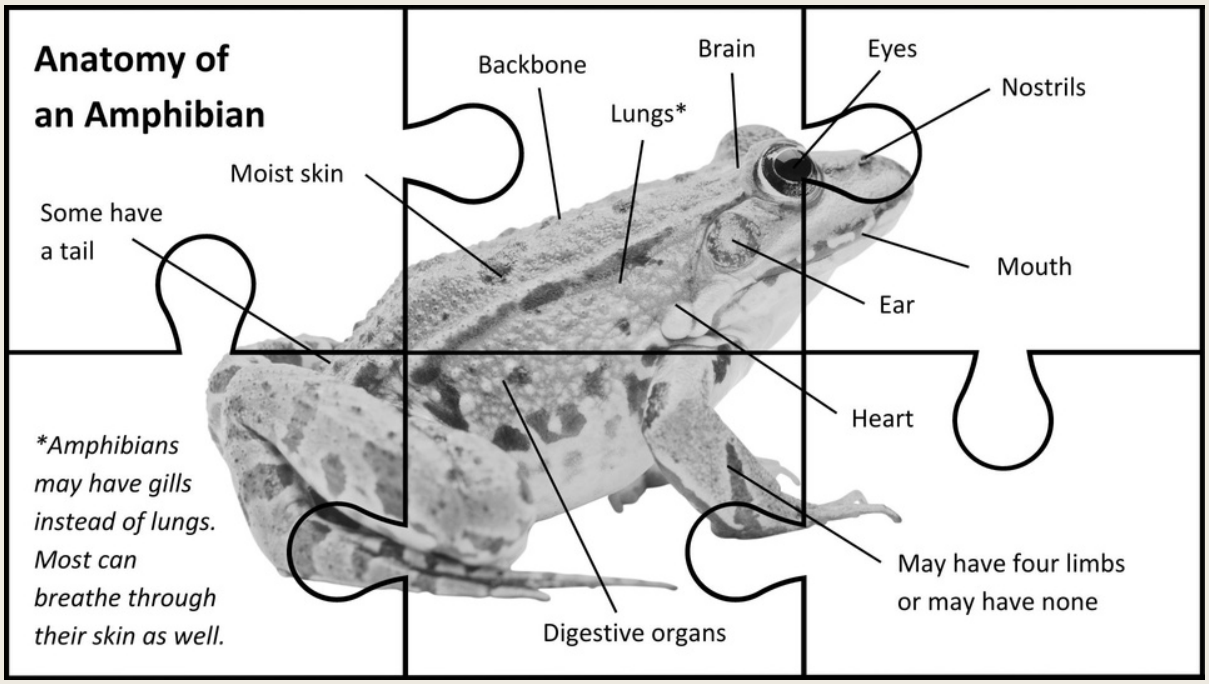

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 5 OF 6)

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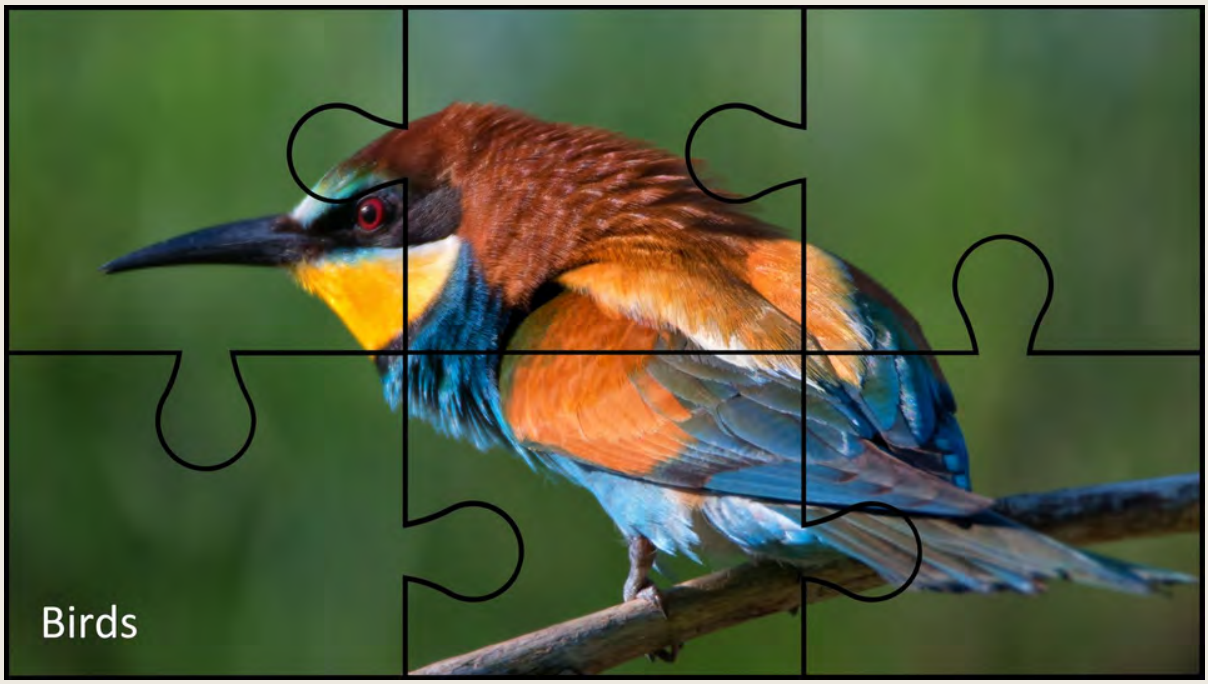

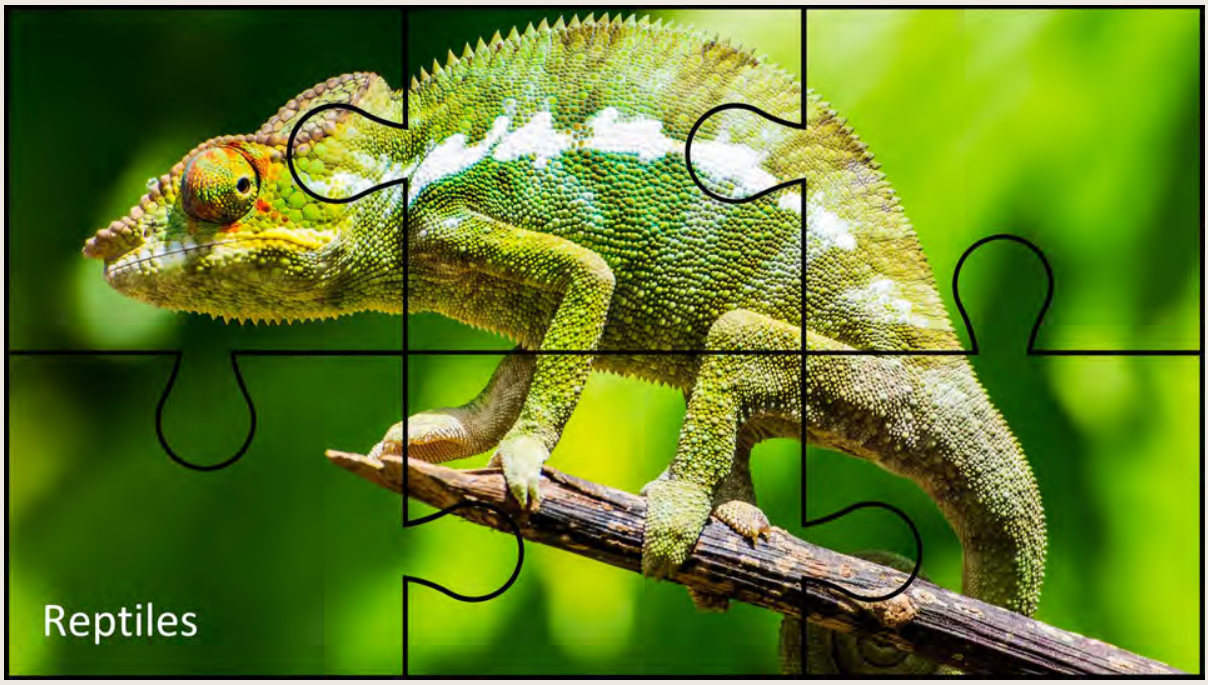

APPENDIX

APPENDIX E – ANIMAL FAMILY PUZZLES (PAGE 6 OF 6)

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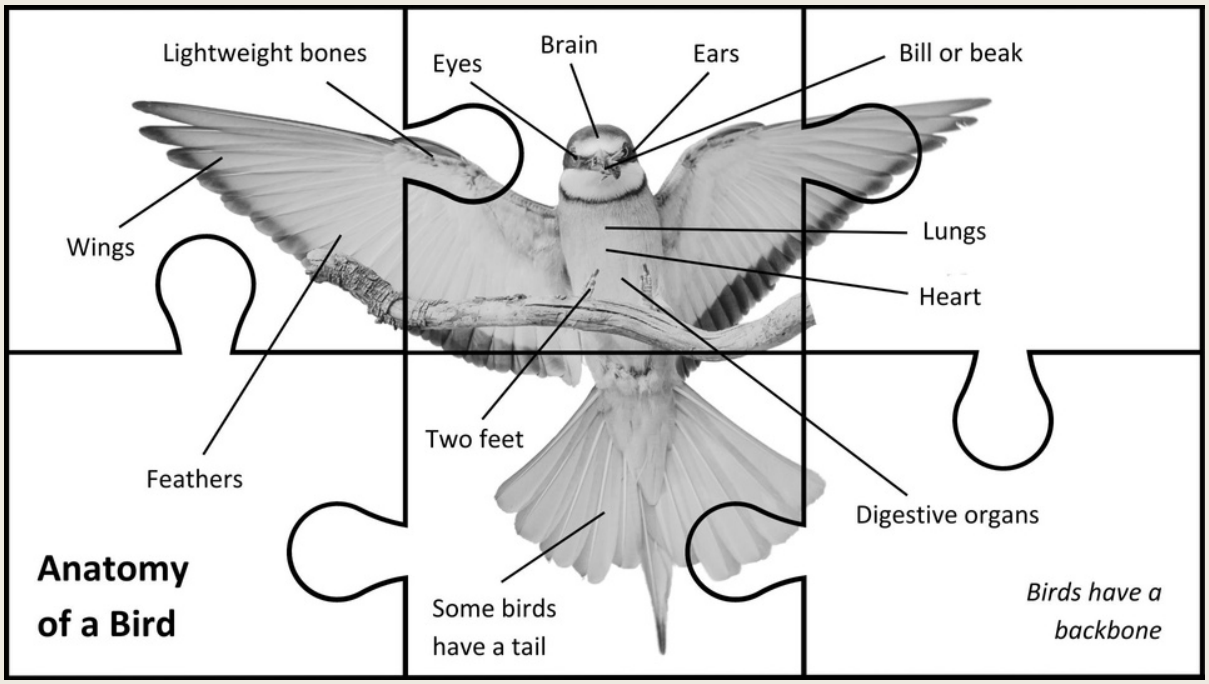

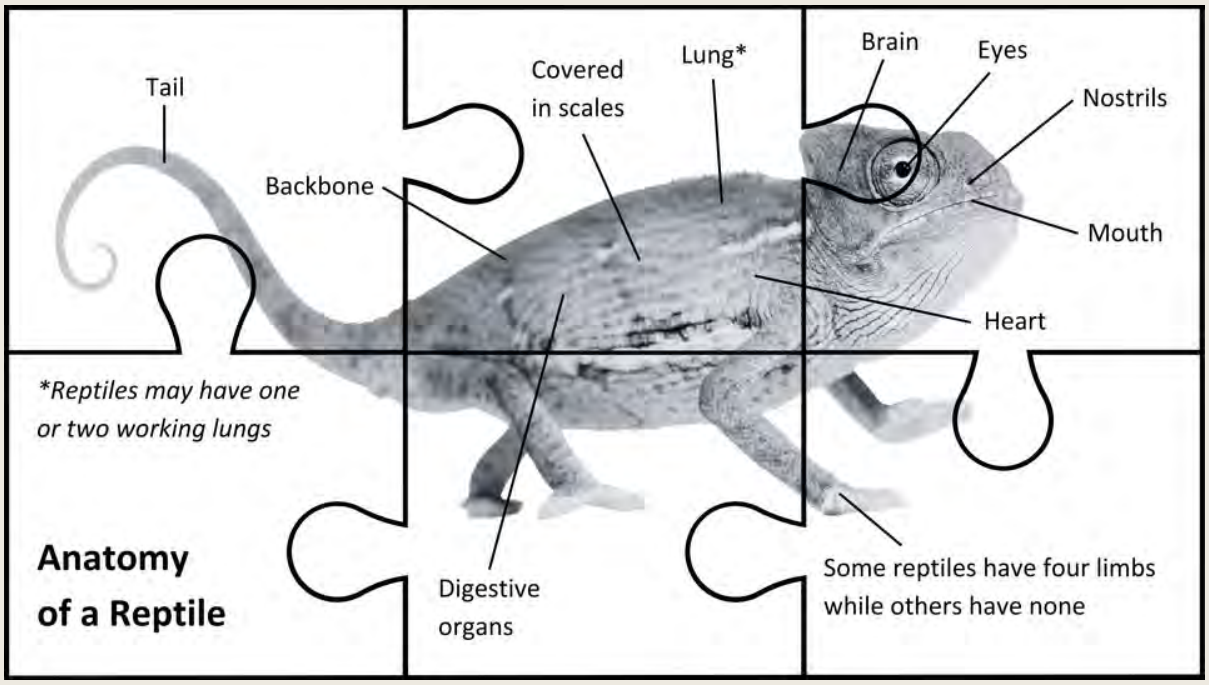

APPENDIX

APPENDIX F – MAKING SENSE STATION CARDS (PAGE 1 OF 3)

Insect Station – Ant Senses

Challenge: I am hungry and need to find an orange to eat.

Make a Prediction: How would an ant find an orange if they cannot see it?

Instructions: Smell all three sponges by the pylon. The sponge labelled 'O' has an orange scent. Sniff the ground next to the pylon in search of the orange scent. Follow the trail of orange scent to one of the boxes. Tilt the box and look under to see if there is an orange underneath. Keep your findings secret from other students. If there is an orange, leave it and put the box back over it. If there is no orange, return to the pylon and try following the orange scent again.

Was your hypothesis correct? Ants use their sense of smell to find food. Instead of using a nose, they smell with their antennae.

Bird Station – Penguin Senses
***Note: This station requires three pairs of students.**

Challenge: I need to find my baby in this big crowd of penguins.

Make a Prediction: How would a penguin find their baby among thousands of other penguins?

Instructions: Partner A is an adult penguin and Partner B is a baby penguin. Each pair of penguins will make up a special call. Adults will stand in a row beside one pylon and close their eyes. Babies will stand at the opposite pylon facing the adults in a random order. Babies will start calling. With eyes closed, adults will slowly walk toward their baby until they reach them.

Was your hypothesis correct? Penguins and their babies have a unique call, so the babies can be found in the colony. Adults will listen for their baby's call using their ears.

APPENDIX

APPENDIX F – MAKING SENSE STATION CARDS (PAGE 2 OF 3)

Fish Station – Clownfish Senses

Challenge: There are predators in the area and I do not want to be eaten.

Make a Prediction: How could a fish tell there is a predator in the area?

Instructions: Partner A looks straight ahead and cannot move their head. Partner B stands 10 steps behind Partner A and sneaks toward them, counting their steps. Partner A will say 'stop' when they see Partner B. How many steps did it take to see Partner B? Partner B will go back to their starting spot. Partner A can now move their head from side to side – as if they have eyes on the side of their head. Partner B sneaks up on them, counting their steps. Partner A will say 'stop' when they see Partner B. How many steps did it take to see Partner B?

Was your hypothesis correct? Eyes that are straight ahead make it easier to hunt, while eyes on the side of the head make it easier to spot predators. Clownfish have eyes on the side of their head.

Reptile Station – Snake Senses

Challenge: I need to eat small animals, but I have no ears to hear them moving around.

Make a Prediction: How can snakes find small animals to eat without hearing them?

Instructions: Partner A (the snake) will put on noise cancelling headphones and close their eyes. Partner B (a mouse) will choose a spot a few steps away from Partner A and begin stomping. Partner A will point to where they think Partner B is based on the vibrations they feel coming from the ground. Partner A opens their eyes to see how close they were in finding the mouse. Repeat and switch partners.

Was your hypothesis correct? Snakes can feel vibrations of other animals, which tells them where the animal is. Snakes can also use their sense of smell and eyesight to find their food.

APPENDIX

APPENDIX F – MAKING SENSE STATION CARDS (PAGE 3 OF 3)

Mammal Station – Whale Senses
***Note: This station requires two pairs of students.**

Challenge: I need to share news with another whale.

Make a Prediction: How would a whale communicate with another whale?

Instructions: A whale was just born and the pod is celebrating. Make up a whale song with your partner to share this happy news. Your song must contain two long grunts and three short whistles, and must express happiness. Teach your song to another pair of whales.

Was your hypothesis correct? Whales have extraordinary hearing and sing songs to send messages to other whales through the water.

Amphibian Station – Frog Senses

Challenge: I need to keep my skin moist, so I can breathe.

Make a Prediction: How can a frog tell if they are in a moist environment?

Instructions: Starting at the first row of felt circles on the ground, touch both circles until you feel the one that is damp. Remember the circle's location in the row. Move to the next row. If you touch a dry circle, go back to the first row and start again. If you touch a damp circle, move on to the next row. Repeat until you reach the pylon by only touching the damp felt circles in each row.

Was your hypothesis correct? Frogs have skin that is sensitive to touch. If their skin feels dry, they can submerge their body in water to keep their skin moist. They also have a mucus layer on their skin to help keep their body from drying out.

APPENDIX

APPENDIX G – MAKING GILLS WORKSHEET

Gills are like a filter, catching the oxygen in water and bringing it into the bloodstream. Debris passes over the gills but is not caught in them. In this experiment, rice will represent oxygen in water. Sand and poppy seeds are debris in the water. The coffee filter, can strainer and small sieve are different kinds of gills.

Materials

- Clear cups x2
- Coffee Filter
- Can Strainer
- Small Sieve
- Sand
- Rice
- Poppy Seeds
- Water

Predictions: Which filter will catch the rice (oxygen), but not sand and seeds (debris)? (circle)

COFFEE FILTER SMALL SIEVE CAN STRAINER

Instructions

- **Step 1:** Fill Cup 1 with water.
- **Step 2:** Put a pinch of sand, seeds, and rice into Cup 1.
- **Step 3:** Place a coffee filter over Cup 2.
- **Step 4:** Pour the water, rice, seeds, and sand from Cup 1 to Cup 2 and record results.
- **Step 5:** Place a can strainer over Cup 1 and remove the coffee filter from Cup 2. Add more rice, sand, and seeds to Cup 2 if needed.
- **Step 6:** Pour all contents of Cup 2 into Cup 1 and record results.
- **Step 7:** Place a small sieve over Cup 2 and remove the can strainer from Cup 1. Add more rice, sand, and seeds to Cup 1 if needed.
- **Step 8:** Pour all contents of Cup 1 into Cup 2 and record result.

Results (circle)

Coffee Filter Results. What was caught in the filter? Rice Sand Seeds

Can Strainer Results. What was caught in the filter? Rice Sand Seeds

Small Sieve Results. What was caught in the filter? Rice Sand Seeds

Which filter caught the rice (oxygen), but not sand and seeds (debris)?

Coffee Filter Small Sieve Can Strainer


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