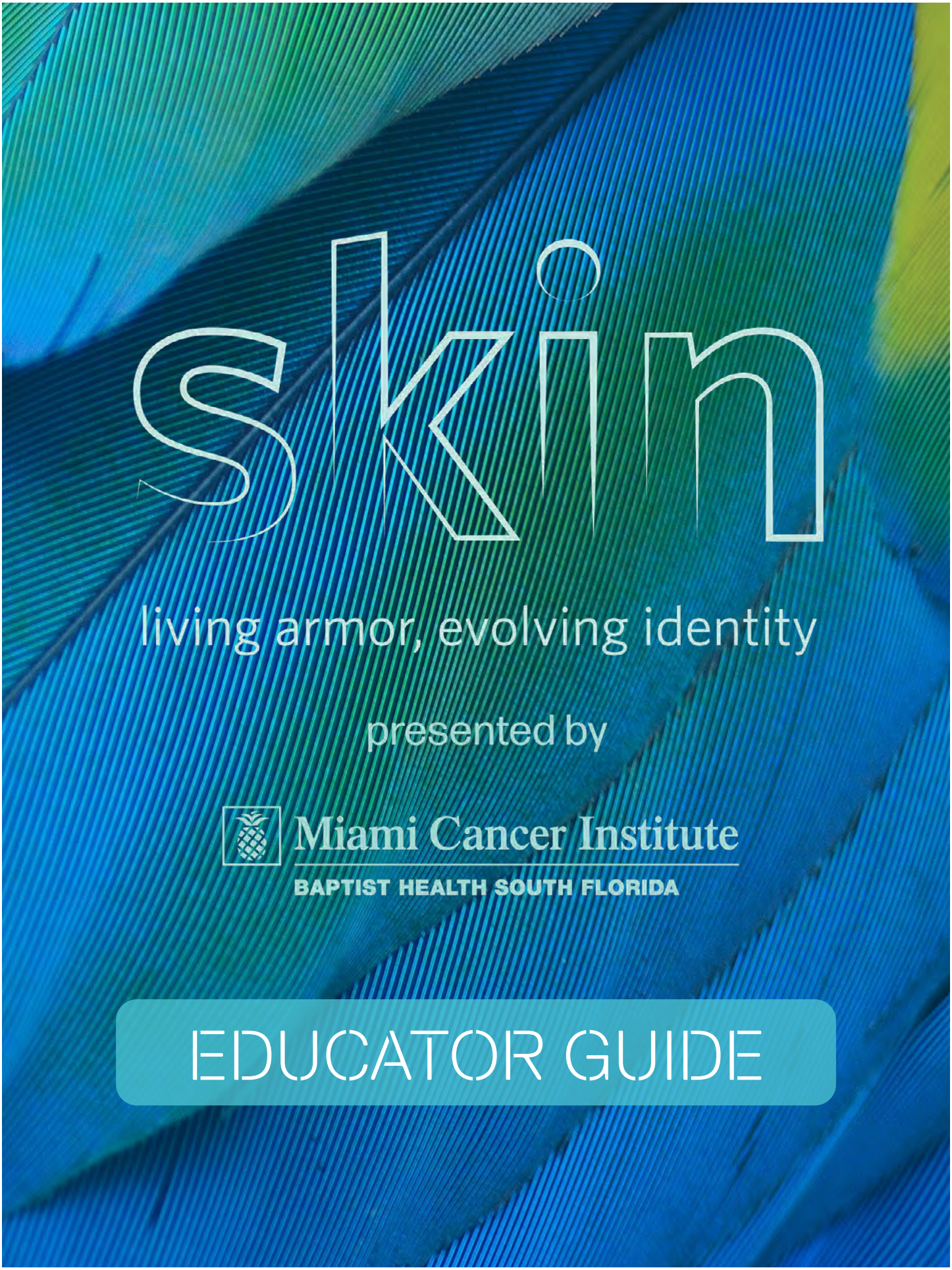

skin
living armor, evolving identity
presented by
Miami Cancer Institute
BAPTIST HEALTH SOUTH FLORIDA
EDUCATOR GUIDE

K-2 Extension – Amazing Adaptations

ACTIVITY GOALS

1. Explore animal diversity through skin.
2. Connect observations about animals to key adaptations for survival.
3. Distinguish between scientific and non-scientific descriptive words.
4. Practice sharing what you know with the class.

STATE STANDARDS

SC.K.N.1.4, SC.K.L.14.3, SC.1.L.14.1, SC.1.L.17.1, SC.2.L.17.1, SC.2.N.1.1-2, SC.2.N.1.5

BACKGROUND INFORMATION

All animals have skin, but your students may be surprised to learn how many ways animals use their skin. Some animals use skin for camouflage, some use skin to keep cool or stay warm, and others may use their skin to protect them from disease. The following lessons explore animal skin through the lens of adaptations. Before you visit *Skin: Living Armor, Evolving Identity*, you can help your students practice making scientific observations and turning observations into hypotheses. After your students visit the exhibition and make these observations, they will be able to practice synthesizing information as they make skin costumes and share their observations with the class. Your students will have fun dressing up as different animals as they learn about animal diversity and adaptation.

PRE-VISIT ACTIVITY

Supplies

1. Presentation with animal images (pages 6-9).

Activity Guide

1. Tell your students that they get to be scientists today! Remind them that scientists observe the world around them, which is something that they can do as a class. However, scientists only use words that mean the same thing to everyone.
2. Go over some descriptive words that are good science words (Green, Tall) because they mean the same thing to every person. Then say that some words that are not good science words (Pretty, Friendly) because some people might disagree on whether an item has that quality or not. Ask your students for examples of good descriptive words and bad descriptive words.
3. Tell your students that you are going to read a descriptive word. Sometimes it will be a good science word and they should raise their hand. Other times it will be a bad science word and they should keep their hand down. Some words to use include Orange, Tasty, Rough, Yucky, Magnetic, Nice, Smooth. Practice until your students have mastered the concept.
4. Introduce your visit to *Skin: Living Armor, Evolving Identity* and tell the students that they are now going to practice using descriptive words to observe animal skin.
5. Before you start the presentation, introduce the concept of a hypothesis. Scientists make observations (things that ANYONE can observe) and use these observations to make hypotheses (predictions informed by the observations). The difference between a guess and a hypothesis is that a hypothesis must be supported by observations.
6. To give an example, ask students to predict what the weather will be next month. Remind them that this is a guess – they don't know what the weather will be. Now tell them, that next month, they observe lots of people carrying umbrellas. Based on this observation, what hypothesis can they make about the weather?

PRE-VISIT ACTIVITY (CONTINUED)

Activity Guide (Continued)

7. Show the animal images presentation. Remember, the goal is to help students use their observations to make hypotheses.
   - The first slide is a frog, hiding within its environment. ***Ask: What do you see or observe?*** Students might observe that the frog is green and that the surrounding leaf is also green. ***Ask: Why might it be helpful to have the frog and leaf be the same color?*** The hypothesis is that the frog is camouflaged to not be eaten.
   - The next slide is a baby harp seal. ***Ask: What do you see or observe?*** They may notice that the seal is in the snow and that it has white fur. They might also observe that it looks very fat. ***Ask: Why might it be helpful to have lots of fat in cold environments?*** The hypothesis is that having a lot of fat works like a coat to help keep the seal warm.
   - The next slide is a crab. ***Ask: What do you see or observe?*** They may notice that the crab has a very hard shell. ***Ask: Why might it be helpful to have skin made of a hard shell?*** The hypothesis is that having a hard shell protects the crab from being eaten.
   - The final slide is a human sweating at the gym. ***Ask: What do you see or observe?*** They may notice that the human is sweating while working out. ***Ask: Why might it be helpful to sweat?*** The hypothesis is that sweat helps humans cool down.

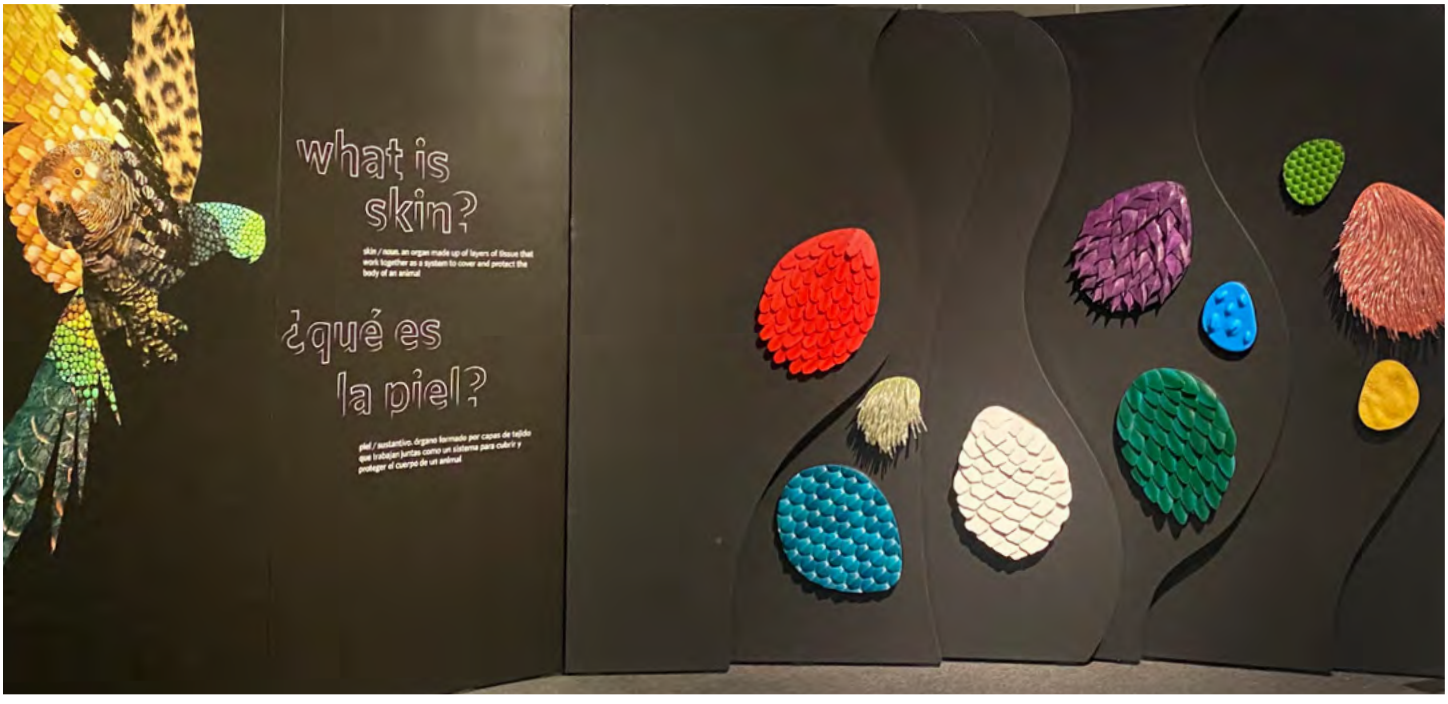
DURING THE VISIT

Supplies

1. Worksheet (1 per student), (page 5)
2. Pencils/Pens (1 per student)
3. Clipboards (1 per student, optional)

Activity Guide

1. Before starting the tour of *Skin: Living Armor, Evolving Identity*, assign each student a group of animals (e.g., mammals, amphibians, birds, reptiles, fish, invertebrates etc. – modify based on their understanding) Make sure that the student circles this animal group at the top of their worksheet.
2. Pass out worksheets. Tell the students that they will be filling out the worksheet on their assigned group of animals.
3. After a few minutes of independent work, divide your students into teams based on their assigned animal group. Have them share anything they learned.



POST VISIT ACTIVITY

Now your students will have the chance to reflect upon and share the information they gathered on the field trip and practice giving presentations to the rest of the class with a fun wearable art project.

Supplies

1. Paper Bags, Grocery Bags or larger (1 per student)
2. Markers, crayons, colored pencils, etc.
3. Scissors

Prep

1. Draw a head sized hole in the bottom of the paper bag and two arm holes on either side. Depending on the age of your students and the time you have for this lesson, you can either cut the bag yourself or have the students cut their own holes.

Activity Guide

1. Start by asking what they learned about adaptations in the exhibition. As you collect answers, work on connecting the student's observation to a hypothesized or real adaptation (e.g., I observed that the snake had skin in shades of brown. I hypothesize that this may be an adaptation to help it stay hidden from prey).
2. Tell your students that they are now going to give a presentation about their animal to the class. During this presentation they should be able to give the full name of the animal, describe the color and texture of that animal's skin, and give a hypothesis about why that animal's skin is an adaptation. These presentations can be individual or in groups.
3. Distribute paper bags to each student, explaining that these will be the costumes that they wear for their presentation. Tell them that they are going to be able to draw their animal's skin on the paper. Discuss ways to bring the skin to life (roughing up the paper, overlapping scales, etc.) Remind students that their costumes should help the other students remember what they learned at the *Skin: Living Armor, Evolving Identity* exhibition.
4. Help students prepare their costumes and practice their presentations. Remind them that they can use their worksheets from their visit as notes.

Amazing Adaptations Worksheet

Your Name: .....

You will be given a group of animals. As you go through the exhibition, look for examples of that group of animals and answer the questions below. Circle your group of animals.

Mammals Reptiles Amphibians Birds Fish Invertebrates

1. What are three examples of this type of animal within this exhibition (write or draw the animals below):

2. Now pick one of those animals and draw what the skin of it looks like up close.

3. Describe the skin of the animal by filling in the below information:

   Color: ..... Texture (how it feels): .....

   Shape: ..... Size: .....

4. Circle two ways that the skin of the animal helps it survive. The skin of the animal helps it:

Find food Avoid predators (being eaten) Breath Heal from injury Stay warm or cold

3-5 Extension: Skin Functions

ACTIVITY GOALS

1. Explore different functions of the integumentary system.
2. Learn the basics of performing experiments to test different hypotheses about the function of skin.
3. Synthesize information into an infographic.

STATE STANDARDS

SC.3.L.15.1, SC.3.L.17.2, SC.3.N.1.1-4, SC.4.L.16.3, SC.4.N.1.1-7, SC.5.L.14.1

BACKGROUND INFORMATION

The **integumentary system** may seem simple, but at *Skin: Living Armor, Evolving Identity*, you'll find anatomy and physiology go more than skin deep.

Your students will see that skin has multiple functions, including:

1. Protection and Immune Function
2. Synthesis of Vitamin D
3. Wound Healing
4. Regulating Body Temperature
5. Sensation
6. Cultivating a Microbiome

In non-human animals, these skin adaptations manifest in a great diversity of structures, from the hard shells of invertebrates to the skin-dwelling barnacles, or marine crustaceans, that live on a whale. In some animals, skin can also have additional functions such as:

1. Water intake
2. Breathing
3. Regeneration
4. Camouflage

In this lesson, your students will get an in-depth look about the structure and function of the integumentary system. First, your students will explore how skin regulates temperature in a series of experiments that combine biology and physics. Then, your students will use these experiments as a model to analyze other functions of skin within the exhibition. Finally, your students will practice synthesizing data as they build their own infographics that explain their findings. This lesson provides a multidisciplinary approach that helps students connect skin function to observations about animal adaptation.

Key Terms

- Integumentary System: Everything that forms the physical barrier between the body and the outside world. This includes the different layers of skin, glands, hair and nails.
- Microbiome: A microbiome is the combination of fungi, bacteria, and viruses that live in or on human tissue. Some parts of the microbiome may be hurtful, some may be helpful, and some may be neutral.

PRE-VISIT ACTIVITY

Supplies

1. Ice Cube (1 per student or 3-5 for whole class)
2. Rubbing alcohol (1 bottle)
3. Cotton Ball (1 per student or 3-5 for whole class)
4. Presentation with animal images. (pages 14-21)

Prep

1. Make sure you have ice and rubbing alcohol available. Rubbing alcohol should be room temperature for maximum effectiveness.

Activity Guide

1. Ask your students what they know about the integumentary system. Give them hints by pointing to your skin, nails, and hair, and then explain it as the integumentary system.
2. Inquire what students know about the function of human skin. Start a list on the board. You will probably get answers such as "sweating" "wound healing" "protection" and "sensation/sense of touch" but may have to help them get to "synthesis of Vitamin D" and "cultivating a **microbiome.**"
3. Ask students if they know if skin has special functions in different animals. You may get answers like "fish breathe through their skin" or "animals can change skin color to match their surroundings."
4. (The following can be done as an experiment in pairs or as a full class exploration, depending on your safety needs. The experiment can also be done on yourself if needed). Explain that you are now going to investigate how human skin helps with temperature regulation. Say that first we are going to explore how human skin helps humans keep warm.
5. Choose a volunteer from the class (or ask one from each group to volunteer) and state that first we are going to explore adaptation to cold. Ask students to predict what reaction skin might have to help keep warm.
6. Take the ice cube and hover it about a centimeter from the skin between the elbow and wrist (note: don't make contact). Ask the volunteer to observe the hair on their arm. It should stand up and form a protective layer over the skin.
7. Ask students why they think this might be effective at keeping warm. Hint: It traps the heat of our body close to our skin, like a blanket.
8. Now, paint a picture of exercising in the heat and having the core body temperature rise. Talk about how damaging this can be for organs if the core body temperature rises above a certain level. Ask students what happens to cool you off – sweat.
9. Get a different volunteer (or another student in the group) to test how our skin helps us sweat. Please have any students conducting the experiment wear safety glasses as needed and be mindful of any potential allergies. If needed, conduct the experiment on yourself. Dip a cotton ball in rubbing alcohol and rub it on the student's skin on their hand quickly (try to not soak the skin). Ask the student to narrate the sensation. After about 10-15 seconds, it should start to feel incredibly cold. As the alcohol evaporates, it takes away more heat from the skin, cooling off the hand. Then explain that water does this too, but because water molecules are attracted to each other, it has a higher heat of evaporation and takes longer. This is called heat transfer.
10. Show students photos of other animals and help them predict the strategies for staying cool or keeping warm.
    - The first photo shows an animal with very thick fur. It can stay warm because of the dense hair that traps in heat.
    - The second photo shows an elephant with very large ears. The large ears help the elephant radiate heat and stay cool.
    - The next photo shows an arctic seal that has a large layer of subcutaneous fat, or fat just under the surface their skin. They stay warm not with hair, but with greater than average subcutaneous fat.
    - The next photo shows a rodent that digs holes. It can stay cool by living underground.
    - The next photo shows a bear, which hibernates in the winter to keep warm.
    - The next photo shows a pig in the mud. It can use the cool mud to keep cool.
    - The next photo shows a dog. It is using panting, to stay cool.
    - The next photo shows a flock of penguins, huddling together to stay warm.
11. Talk about how different animals use different strategies to achieve a similar result.
12. Explain that when they visit *Skin: Living Armor, Evolving Identity*, they are going to be comparing the integumentary system of different animal groups to understand animal diversity.

DURING THE VISIT

Supplies

1. Worksheet (1 per student), (page 13)
2. Pencils/Pens (1 per student)
3. Clipboards (1 per student, optional)

Activity Guide

1. Divide your students up into groups for investigating different strategies used by different animals to fulfill different needs. We suggest the following groups: Find Food, Avoid Predators, Protect from Outside World, Heal Wounds, Grow a Microbiome, Regenerate, and Provide Sensation.
2. Distribute the worksheets. Let students work on their own for 10-15 minutes then invite them to share what they've discovered.

POST VISIT ACTIVITY

Supplies

1. Large paper/posterboard (1 per person)
2. Markers/Colored Pencils/Crayons

Activity Guide

1. Ask students to share what they learned about how skin works across different animal groups. .
2. Invite each group to share one fun fact about their topic with the rest of the class.
3. Distribute supplies to students. Tell them that they are going to create infographics to explain the diversity of their assigned topic. Show examples of infographics.
   https://www.canadiangeographic.ca/article/infographic-fun-facts-about-canadas-bear-species
   https://www.marineconservation.org.au/wp-content/uploads/2019/08/sawfish-poster-final.pdf
4. Remind students that an infographic should have a(n):
   - Descriptive Title
   - Explanation of why animals need their skin to perform this function
   - Comparison of this function across at least three different animals
   - Drawings to support b and c.

Skin Functions Worksheet

Your Name: .....

Answer the following questions based on information you can gather in the exhibition about an assigned group topic. Write in the group topic in the designated spaces to complete the questions.

Group Topic: .....

1. How does an animal's skin help the animal ..... ?
   Explain using at least two sentences. [Group Topic]

2. What are three animals in *Skin: Living Armor, Evolving Identity* who use this feature in their skin? Write down the animal and what category of animal it is (insect, fish, reptile, mammal, etc.).

	ANIMAL	CATEGORY
a.	.....	.....
b.	.....	.....
c.	.....	.....

3. Choose one of these animals and draw a picture showing how the animal uses its skin to ..... .
   [Group Topic]

4. Write down two – three fun facts about this animal's skin that you learned from the exhibit.

6-8 Extension: Skin Deep

ACTIVITY GOALS

1. Review surface area and volume and apply it to biology.
2. Apply mathematics and physics to help explain adaptations observed in animals.
3. Use models to develop practical ways to test complex science ideas.

STATE STANDARDS

MA.6.GR.2.3, MA.7.GR.2.6, MA.7.G.3.9, MAFS.8.G.1, SC.6. N.3.2-3, SC.7.P.11.1, SC.7.P.11.4, SC.7.N.3.2, SC.8.P.9.3

BACKGROUND INFORMATION

Skin is important for an animal's survival. It can help an animal find food and water, provide shelter and even avoid predators. However, one other key function of skin is to help dissipate heat. Animals that live in cold weather tend to have a low surface area to volume (SA:V) ratio (think a fur seal) to help them stay warm, while animals that live in hot areas have a high SA:V ratio to help their bodies not overheat. Scientists realized more than 100 years ago that the appendage length and body size of animals can be predicted by the latitude at which they live. Before you visit *Skin: Living Armor, Evolving Identity*, you can explore volume, surface area and the ratio between the two as you use math, newspapers and a little fun to think about human dimensions. During your field trip, students will take the seeds of ideas about SA:V ratios as they make observations of animals across the exhibition and think about animal adaptations. Finally, after your visit, you'll conduct physics experiments to examine how SA:V correlates with temperature dissipation, and use ecological theories to make graphs and predict animal morphology based on latitude. This is a cross-curricular lesson plan that combines mathematics, physics, and biology to help strengthen student's understanding of their own bodies and the world around them.

Key Terms

- Surface Area: The total area of a surface of a three-dimensional object
- Volume: The amount of three-dimensional space than an object occupies
- Surface Area to Volume Ratio: Surface area divided by volume
- Allen's Rule: Animals of the same species or genus that live in higher latitudes tend to have a larger SA:V ratio than their more tropical counterparts.
- Bergmann's Rule: Animals of the same species or genus that live in higher latitudes tend to have larger body size than their more tropical counterparts.

PRE-VISIT ACTIVITY

Supplies

1. Newspaper/Magazines (enough to cover one student entirely in newspaper)
2. Tape (to assist with covering the student)
3. Presentation with Corgi and Whippet photos (page 29)
4. Scale (Optional – if you don't want to take a student's weight, please use 100lbs)

Activity Guide

1. Tell students that they are going to do an exploration about surface area and volume in preparation for visiting *Skin: Living Armor, Evolving Identity*.
2. Review concepts of surface area and volume.
3. Request a volunteer from the class who wants to be measured. Ask students how they might go about measuring the volume of their classmate. You may get answers like they could see how much water their classmate could displace. Suggest that those are all good ideas but might not be practical in a classroom.
4. Offer a measurement that the density of a human is about 8.3lb per gallon and ask how that might help them make an estimate. Lead students to the idea that density = mass/volume, which means if we know two of the three (in this case density and mass), we can calculate the third.
5. Take volunteer's weight (or use 100lb). Have students do the calculations. You should get a volume of between 10 and 14 gallons (make sure that your students use correct units!)
6. Now that we have volume, ask students how they might get surface area. If students are struggling, offer the stacks of newspapers and see if that provides inspiration.
7. Have the volunteer stand with their feet and legs together, and their arms down by their sides. Working with the volunteer (and having other students help if your school safety protocols allow), cover the student in newspapers, folding and taping the edges together as needed. Make sure the volunteer does the covering and taping of sensitive areas and skip the head.
8. Carefully remove the tape so that you can release the volunteer. Lay the paper flat on the floor.
9. Measure the area of the surface. Help your students develop strategies for measuring irregular surfaces (e.g., dividing up into smaller squares). Answers should be between 15 and 20 square feet, depending on the size of the student.
10. Finally, calculate the surface area to volume ratio. Answers will likely be between 1.2 and 1.4 square feet per gallon.
11. Ask students what might make the surface area to volume ratio bigger or smaller. A bigger surface area to volume ratio will occur when the surface area is bigger (things that have lots of nooks and crannies or long, slender appendages) and a smaller surface area to volume ratio will occur when the volume is bigger (things that are compact in form).
12. Show the students the two pictures of dogs shown below. Tell them that scientists measured that they have almost identical volumes. Ask them, based on what they just learned, which dog has the bigger surface area and therefore the bigger surface area to volume ratio. (The whippet has a higher SA:V ratio than the corgi).
13. Tell them that when they go on their field trip to Frost Science, they will see lots of animals with different surface area to volume ratios. As they visit, they should start taking observations to help make predictions about why animals differ in this way.

DURING THE VISIT

Supplies

1. Worksheet (1 per student), (page 25)
2. Pencils/Pens (1 per student)
3. Clipboards (1 per student, optional)

Activity Guide

1. Distribute worksheets. Students will likely need 20-30 minutes to complete the worksheet in the exhibition.
2. Let students work on their own then invite them to share what they've discovered.

POST VISIT ACTIVITY

Now that students have been able to visit the exhibition, they have hopefully been introduced to ways to take the SA:V activity and apply it to ideas of skin. Now they are going to test hypotheses about heat retention and explore how latitude might be a predictor of appendage and body size using ecological rules.

Supplies

1. Water balloons (3 total, though we suggest back-ups should some pop)
2. Warm Water (8 oz)
3. Thermometer
4. Soft Tape Measure
5. Allen and Bergmann's Rules Worksheet (page 26-27)

Prep

1. At the start of class, fill up three balloons, one all the way full, one halfway full, one barely full of warm water.
2. Record the starting temperature of the water, as well as the radius of each balloon on the board.

Activity Guide

1. As your students enter, explain the experiment. Now that you've visited the *Skin: Living Armor, Evolving Identity* exhibition, you are going to explore how in surface area to volume ratios temperature changes the way that organisms dissipate heat.
2. Ask your students how we dissipate heat (sweating, etc.). Ask whether, all else being equal, individuals with a lower or higher surface area to volume ratio will dissipate heat better (higher).
3. Have students record their hypothesis, then calculate the surface area and volume ratios of each of the three balloons (assume they are spheres).
4. Tell the students that you are going to wait 20-30 minutes then measure the changes in temperature in each balloon. Then the class will be able to test their hypotheses.
5. While they wait, ask students to report on their observations with the exhibition. Start asking questions about habitat and what those individuals might need to survive in their environments from a body temperature perspective.
6. Introduce Allen and Bergmann's rules. Allen's rule states that animals that need to dissipate heat will have longer appendages. Bergmann's rule states that animals that need to dissipate heat will have a larger SA:V ratio.
7. Distribute the worksheet on Allen and Bergmann's rules. Your students will answer questions about various animals, using both biology and mathematical thinking.
8. After 20-30 minutes have passed, pause the class activity, and tell them that you are now going to measure the temperature of the water in the balloons.
9. Dump out the water into three vessels and measure the temperature of the water. Connect this back to changes in the surface area to volume ratio.
10. Have students finish their worksheet and answer the questions.

Skin Deep Worksheet

Your Name: .....

Explore the exhibition to answer the following questions.

1. Draw the layers of skin in a human below, labeling each layer.
   Hint: You can find more information in the "What is Skin" section of the exhibition.

2. Skin has a variety of different functions across animals. In the "Interacting with Environments" section of the exhibition, please describe two examples of animals that use skin for the following functions:

   1. Regenerating Skin:

      Animal 1: .....

      Animal 2: .....

   2. Skin as Protection:

      Animal 1: .....

      Animal 2: .....

   3. Skin as Sensation:

      Animal 1: .....

      Animal 2: .....

   4. Skin as Environment:

      Animal 1: .....

      Animal 2: .....

3. Humans vary in skin pigmentation. In the final section of the exhibition, "Human Pigment and Color," you'll hear about some adaptive explanations for human skin color variation.

   1. What are the two types of pigment that make up human skin variation?
      What colors do these pigments express?

      Pigment 1: .....

      Pigment 2: .....

   2. Describe how human skin color may be an adaptation for Folate and Vitamin D production.

      .....

      .....

      .....

Allen and Bergmann's Rules Worksheet

Your Name:

Rabbits are found all over the world. While all rabbits may appear similar in size and shape, you might be surprised to learn how much they vary. Below are 10 different rabbits. Compute the ratios for surface area to volume and ear length to volume. Put them in the tables.

Rabbit	Surface Area (ft^2)	Volume (ft^3)	Latitude	SA/V Ratio	Ear Length (ft)	Ear Length / Volume Ratio
1	1.4	1	5° N		.9	
2	1.8	1.2	13° N		.61	
3	2.2	1.5	21° N		.65	
4	2.7	2	25° N		.7	
5	3.1	2.5	37° N		.81	
6	3.5	2.9	42° N		.7	
7	3.7	3.1	54° N		.64	
8	4.2	3.6	59° N		.62	
9	4.5	3.9	62° N		.61	
10	4.9	4.5	79° N		.59	

1. What relationship do you notice between appendage length and surface area?

2. What relationship do you notice between surface area: volume ratio and latitude?

3. What is your hypothesis for why this relationship exists?

Allen and Bergmann's Rules Worksheet *(continued)*

4. Where is the rabbit with the largest SA:V ratio located? Where is the rabbit with the smallest SA:V ratio located?

5. Each of the rabbits you measured had the same shape. Why does SA:V ratio decrease with increasing size?

6. What rabbit do you think would be best adapted for cold weather? Why?

7. Bergmann's rule is less true for many small animals such as rodents. What are some reasons why this may be the case?

8. Other than having a high SA:V ratio, what are three other adaptations that animals use to regulate temperature?

Allen and Bergmann's Rules Worksheet: Answer Key

Rabbit	Surface Area (ft^2)	Volume (ft^3)	Latitude	SA/V Ratio	Ear Length (ft)	Ear Length / Volume Ratio
1	1.4	1	5° N	1.4	0.9	0.9
2	1.8	1.2	13° N	1.5	0.61	0.50833333
3	2.2	1.5	21° N	1.46666667	0.65	0.43333333
4	2.7	2	25° N	1.35	0.7	0.35
5	3.1	2.5	37° N	1.24	0.81	0.324
6	3.5	2.9	42° N	1.20689655	0.7	0.24137931
7	3.7	3.1	54° N	1.19354839	0.64	0.20645161
8	4.2	3.6	59° N	1.16666667	0.62	0.17222222
9	4.5	3.9	62° N	1.15384615	0.61	0.15641026
10	4.9	4.5	79° N	1.08888889	0.59	1.13111111

1. What relationship do you notice between appendage length and surface area?
   Animals with larger appendages tend to have larger surface areas.
2. What relationship do you notice between surface area: volume ratio and latitude?
   Animals tend to have a lower SA:V ratio near the poles (high latitude) and a high SA:V ratio near the equator.
3. What is your hypothesis for why this relationship exists?
   Animals need to trap heat in the cold and therefore want to have a lower SA:V ratio and smaller appendages. Animals that live in the poles need to find ways to cool down and therefore have a high surface area and large appendages.
4. Where is the rabbit with the largest SA:V ratio located? Where is the rabbit with the smallest SA:V ratio located?
   The rabbit with the largest SA:V ratio is located near the equator (in warm climates) and the rabbit with the smallest SA:V ratio is located near the poles (cold climates).
5. Each of the rabbits you measured had the same shape. Why does SA:V ratio decrease with increasing size?
   Surface area is a 2D measure, while volume is a 3D measure. So SA:V ratio gets smaller because it scales at 2/3 scale.
6. What rabbit do you think would be best adapted for cold weather?
   A rabbit with a small SA:V ratio would be best adapted to cold weather, as it would dissipate heat less quickly and help the animal stay warm.
7. Bergmann's rule is less true for many small animals such as rodents. What are some reasons why this may be the case?
   Other constraints on their physiology, behaviors such as burrowing.
8. Other than having a high SA:V ratio, what are three other adaptations that animals use to regulate temperature?
   Going out during certain time periods, sweating, subcutaneous fat storage, body hair, clothing, air conditioning/heat.