

# Specialized Structures & Environments

## Utah Science - Heredity



### Materials

- ◆ a variety of outerwear, including different types of coats and jackets, sunscreen, hats, gloves, sunglasses, boots, sandals, etc.
- ◆ samples of different types of outer coverings used by animals, such as rabbit fur, seashells, sheep wool, snakeskin and feathers; and/or pictures of different animals like fish, dogs, frogs, leopards, tigers, porcupines, etc. *Teaching Tip:* These pictures can also be used for the “Variations for Survival” activity.
- ◆ 1 butterfly pattern photocopied onto white paper for each student
- ◆ crayons and/or markers
- ◆ tape

*A free wool sample can be obtained from Utah Agriculture in the Classroom; email your request to [agstuff@usu.edu](mailto:agstuff@usu.edu)*

### Background

Variations are differences in appearance of an inherited trait among members of a species. These variations give a species (a group of plants or animals that can only reproduce among themselves) a better chance to live, or a survival advantage. Other variations may include specialized structures or body parts.

Outer coverings of animals have many functions that help each species survive in its particular environment. The following are some functions of outer skin coverings:

**Temperature control:** The fur of some animals keeps a layer of warm air close to the body; sweat glands in the skin also keep the body cool.

**Defense against parasites:** Animals with scales and shells have some extra protection against small parasites that try to enter through their skin.

**Defense against poisonous plants:** Oils from plants such as poison ivy irritate the skin. The fur of animals keeps the oily irritant away from the skin until the oil breaks down over time.

**Defense against sunburn:** Ultraviolet rays from the sun can damage skin. Tropical animals such as monkeys and parrots are protected from sunburn by their hair or feathers.

**Defense against predators:** The skin of the puffer fish and the porcupine has sharp spines that repel predators. The backbone of the turtle is a scale-covered shell that provides defensive protection.

**Warning to predators:** Poison arrow frogs and monarch butterflies have toxic substances in their bodies that can kill or repel a predator. Their bright warning colors turn predators away before they attack. Skunks have a bold black and white warning pattern because most animals that prey on them only have black and white vision.

*Utah Agriculture in the Classroom*

**Time:** 45 - 60 minutes

**Grade Level:** 5

### Science, Standard 5

Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

#### Objective 2

Describe how some characteristics could give a species a survival advantage in a particular environment.

- Compare the traits of similar species for physical abilities, instinctual behaviors, and specialized body structures that increase the survival of one species in a specific environment over another species (e.g., difference between the feet of snowshoe hare and cottontail rabbit, differences in leaves of plants growing at different altitudes, differences between the feathers of an owl and a hummingbird, differences in parental behavior among various fish).
- Describe how a particular physical attribute may provide an advantage for survival in one environment but not in another (e.g., heavy fur in arctic climates keeps animals warm whereas in hot desert climates it would cause overheating; flippers on such animals as sea lions and seals provide excellent swimming structures in the water but become clumsy and awkward on land; cacti retain the right amount of water in arid regions but would develop root rot in a more temperate region; fish gills have the ability to absorb oxygen in water but not on land).
- Research a specific plant or animal and report how specific physical attributes provide an advantage for survival in a specific environment.



**Mimicry:** Some organisms have coloring—distinctive patterns or other behaviors which resemble other organisms that may be dangerous, poisonous or unpleasant to eat. Predators avoid these organisms because they think these counterfeits are the real thing. For example, viceroy butterflies that are not toxic to predators mimic the coloration of monarch butterflies that are poisonous. Two or more unpalatable species may also resemble each other, providing increased protection for both against predators.

**Camouflage from predators:** The patterns on some insect skins mimic leaves, bark and even bird droppings. Animals like zebras have patterns that help them blend into tall grass.

**Deceiving predators:** False heads or large, fake eyes can startle predators momentarily, allowing the prey to escape. They can also lead the predator to strike a non-vital area, such as attacking the animal's tail instead of its head.

**Attraction of a mate:** Some birds and butterflies have brightly colored wings to attract potential mates.

### Invitation to Learn

1. Have a variety of outerwear displayed. Ask for several student volunteers to assist in the demonstration.
2. Ask the volunteers which of the items they would wear:
  - A bright, crisp fall afternoon?
  - A cold, snowy winter night?
  - During a rainstorm?
  - A cool summer's evening?
  - Going to the beach?
  - Going hiking?

The students then choose an appropriate combination of outerwear for that situation.

3. Discuss with the class how we wear different outerwear throughout the year depending on how our environment changes.
4. Tell the students that animals have different outer coverings depending on where they live, what they eat, and what eats them. They will be investigating how the environment and outer skin coverings can work together for an animal's survival advantage.

### Activity 1: Procedures

1. Discuss with students the different functions of outer coverings of animals.
2. Pass around the samples of outer coverings used by animals and/or pictures of animals. Have students respond, in chart form, to the following for each example:
  - Describe the physical traits of the outer covering.
  - Describe the coverings' possible functions.
  - Describe the environment in which the animal who wears it would live.
  - Describe the advantages it would give the animal.
3. Describe the limitations it would give the animal.
4. As a class discuss their responses to each example.



## Activity 2: Procedures

1. Distribute a butterfly pattern to each student.
2. Instruct each student to color their butterfly in such a way that it will blend into an area of the classroom of their choice.
3. Send half of the class out of the room while the other half hides their butterflies, taping them in place.
4. Bring in the students and challenge them to find the butterflies; the winner is the student whose butterfly takes the longest to find.
5. Repeat the activity to allow the other half of the class an opportunity to hide their butterflies.
6. Take the winning butterflies and place them on backgrounds that makes them “stand out.”
7. Pose the following questions to the students:
  - What would happen to these butterflies if their environment suddenly changed and their coloration became an “EAT ME” sign instead of protection?
  - What would eventually happen to this species of butterfly?
  - What possible things could happen to give this species another survival advantage?
8. Arrange for 2-3 adults to come into your classroom for the next part of this activity. *Teaching Tip:* The students will enjoy interacting with the principal, vice principal, and other adults with whom they have a relationship.
9. Explain to students that the adults will become visiting birds and have to find a certain amount of “food” within one minute. Have the students hide ALL of their butterflies in the classroom “environment.”
10. Outside the classroom, explain to the adults the purpose of the activity and their “bird roles.” Have the adults come in and proceed with the activity. Have the children reward the “bird” that finds the most food.
11. Afterwards, have a discussion with the students about how organisms use their special structures for a survival advantage in a particular environment.

This lesson was created by Agriculture in the Classroom at Utah State University and is part of the Fifth Grade Science Teacher Resource Book (TRB3) <http://www.usoe.org/curr/science/core/5th/TRB5/>. The TRB3 was designed as a textbook for teaching science curriculum. This book covers all the objectives of each standard and benchmark. Students who comprehend the content in this lesson should do well on the End-of-Level (CRT) tests.



