HOW DO LIVING THINGS' BEHAVIORS HELP THEM MEET THEIR NEEDS?

Overview

In this lesson students will learn about behavioral adaptations by playing a game that compares and contrasts different strategies prey animals use to avoid predators.

Objectives

On successful completion of this lesson, students will be able to:

- identify examples of animals who migrate, hibernate, or stay active in winter;
- distinguish between physical adaptations and behavioral adaptations; and
- explain two ways prey animals can use behavioral adaptations to avoid predators.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

[4, 5] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.

[4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict and communicate.

[4] SC1.1 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution, by showing the relationship between physical characteristics of Alaskan organisms and the environment in which they live.

[4] SC2.2 The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by describing the basic characteristics and requirements of living things.

[5] SA1.2 The student demonstrates an understanding of the processes of science by using quantitative and qualitative observations to create inferences and predictions.

[5] SC2.1 The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by identifying and sorting animals into groups using basic external and internal features.

Alaska Cultural Standards

[E] Culturally- knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E2] understand the ecology and geography of the bioregion they inhabit.

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Bering Strait School District Scope & Sequence

4th Grade Sequence #4 Living Things Animals

A. Describe the basic characteristics and requirements of living things.
I. Use scientific processes and inquiry to directly support concepts on animals.

5th Grade Sequence #5 Living Things Animals

B. Identify and sort animals into groups using basic external and internal features.
F. Use scientific processes and inquiry to directly support concepts on animals.

Materials

- Pictures of willow, lichen, muskoxen, caribou, wolves, and grizzly bears (one of each)
- Bandanas / strips of fabric (ten)
- Small plastic traffic cones (six)

Multimedia

REACH Multimedia 4-6: "How Do Plants and Animals Adapt?"

REACH Multimedia K-3: "Watch the Balance of Nature"
Available at: www.k12reach.org

Additional Resources

HSP IV; Ch. 3, Lesson 2

HSP V; Ch. 4, Lesson 3

Activity Preparations

1. Read through the entire lesson, including the background information in the Whole Picture section.
2. Decide where you are going to play the tag game, such as a gymnasium space or, weather permitting, play outside. If clearing a space to play in your classroom, you may want to limit it to a walking simulation rather than a running game.
3. Mark a rectangle for the area using the six cones, similar to a basketball or volleyball court, with a cone at each corner and two cones indicating a centerline.
4. The game is designed for play with a minimum of 16 students. If you have a smaller class size, partner with another class in your building.

Whole Picture

The animals that inhabit the Bering Strait region are uniquely adapted for its harsh weather. Animals have physical adaptations for the cold, such as, the insulating layer of fat boasted by marine mammals, including whales, seals, and walruses. Lesson 16 "How Do Living Things'

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Bodies Help them Meet their Needs?" deals with physical adaptations. Many animals also deal with the cold temperatures, and the lack of food sources associated with winter conditions, through behavioral adaptations, such as: migration, hibernation, or staying active.

The Bering Strait region provides significant nesting grounds for many species of migratory birds. Many important subsistence animals also migrate, including whales and caribou. The HSP textbook lessons further address the concepts of migratory and hibernation behaviors.

Other behavioral adaptations include the tactics predators use for hunting and the strategies prey employ to avoid predation. Physical and behavioral adaptations work hand in hand. For example, a snowshoe hare has two types of camouflage; their fur blends in with their surroundings, and they also "freeze" when they sense danger. Prey adapted this behavior of sitting very still because their predators have eyesight that is keenly adapted to movement.

Caribou travel in large herds and the adult females have one calf every year. The calves are able to stand the day they are born and by the time they are three days old they can run as fast as a wolf, their most common predator. Living in a large group is a behavioral adaptation, and it means that there are lots of eyes, ears, and noses alert to danger. When one member of the herd begins to run, they will all run, causing a stampede. The chaos of the stampede makes it more difficult for the wolves to focus on an individual animal to attack. Amidst the confusion, mother and calf pairs try to stick together. Still, roughly half of the calves in a herd may die in a year, many falling to predators. Due to the high numbers of yearly offspring to start with, enough calves survive to continue the herd.

Compared to caribou, muskox herds are smaller, usually about thirty animals. Under typical nutritional conditions, the adult females may only have one calf every other year. An adult muskox can run about twenty-five miles per hour, but they cannot maintain that pace for very long without overheating. With their large size and fierce horns, the better strategy for them is to stand and fight off predators. They will group up to do this, and stand shoulder to shoulder, facing the bear or wolf. They protect the calves, so if there are several predators, the adults form a defensive circle with the calves positioned in the center. With relatively few calves in each herd, the animals expend a fair amount of energy caring for young.

As climate changes and some animals relocate out of the area, new animals, more suited to the changed conditions, also move in to the area. Perry Pungowiyi recounted the story of a young boy who saw a snowshoe hare and told his uncles (who initially said, "there's no rabbits around here"). When it turned out the boy was right, they were "excited to see that snowshoe hare, they'd never seen one before" (Pungowiyi 2010).

Hunting is a very important part of Alaska Native culture. It is important for hunters to make careful observations about which species are increasing in population and which are declining in an area. It is also important for successful hunters to understand the habitats and adaptations of their prey.

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Vocabulary

environment – all the living and nonliving things that surround and affect an organism

physical adaptation – a feature an organism has that helps it survive in its environment

behavioral adaptation – something an organism does that helps it survive in its environment.

hibernation – a dormant, inactive state in which normal body activities slow

migration – the movement of animals from one region to another and back

Activity Procedure

1. Begin with a review of food chains. Have students generate examples for food chains involving caribou and muskoxen. Create food chains on the board using the pictures provided and adding arrows. The energy flows from producers, including, lichen and willow --> to primary consumers, such as, caribou and muskoxen, and then --> to secondary consumers. Their predators are primarily wolves and bears. Point out that while caribou and muskoxen have the same predators, and very similar diets, they have some very different behaviors.
2. Create a Venn diagram of muskoxen and caribou traits and behaviors. Examples may include: caribou have antlers while muskoxen have horns. Caribou have long legs and muskoxen have short legs. Both caribou and muskoxen eat lichen and willow, and both are hunted by bears and wolves. Caribou run from their predators, while muskoxen take a defensive stance.

   a. If winter strategies were not covered, provide this example: caribou migrate while muskoxen stay active. Although muskoxen do not seem very active, they do not hibernate either. In the summer they do not travel great distances because they want to avoid overheating. In the winter they do not travel great distances because they do not want to burn many calories when food is scarce.
   b. Pause here to ask students if they know of another behavioral adaptation animals demonstrate in winter. One answer is hibernation. Generate a quick list of animals that either migrate, hibernate, or stay active in winter.
3. Review the definitions of physical and behavioral adaptations. Return to the Venn diagram and circle the examples of physical adaptations.

4. Explain that they are going to act out how both species have adapted tactics for avoiding predators. Though both caribou and muskoxen live in herds, the strategy plays out differently for each.

Muskoxen versus Wolves

- For a group of about 16 students, select one student to be the wolf. (For a group size closer to 32 students, select two wolves.)
- Divide the remaining students into groups of three. In each group of three, one student will play the muskox calf and the other two will represent adult muskoxen. Have the calves wear a bandana (or strip of fabric) as a headband or armband to make them easily identifiable. If you do not have a multiple of three, extra players will be adult muskoxen.
- Have the wolf (or wolves) stand on the sideline by one of the centerline cones. Have the prey stand in the end zone, forming a line between the two cones.
- Explain that the wolf's goal will be to tag a calf.
- Explain that the muskoxen group must work together; when the round starts, their goal is to protect the calves. The adults will try to form a circle as quickly as they can, and the calves will hide in the center. Wolves may try to sneak into the circle to tag calves, but no "unnecessary roughness" allowed!
- Begin the round with a signal, such as, "Ready, Set, Go!"
- Play several rounds, with a brief discussion after each round about who was successful and why. Modify the game rules as you see fit, to get an outcome where the muskoxen are usually successful in protecting their calves.

Caribou versus Wolves

- For a group of about 16 students, select one student to be the wolf. (For a group size closer to 32 students, select two wolves.)
- Divide the remaining students into groups of three. In each group of three, one student will play the mother caribou and the other two will represent the calf. Use a bandana (or strip of fabric) to tie the partners' legs together just above the knee, the same way you would in a three-legged race. This will demonstrate that a young calf cannot run as fast as an adult caribou. The joined pair should stay close to their third group member, the way a calf follows its mother. If you do not have a multiple of three, extra players will be lone adult caribou.
- Have the wolf (or wolves) stand on the sideline by one of the centerline cones. Instruct the prey to stand in the end zone, forming a line between the two cones.
- Explain that the wolf's goal will be to tag a calf.

- Explain that the caribou's goal is to reach the other end zone as a group of three without the calves getting tagged. This will represent a successful migration. The mother caribou may coach their teammates verbally, but they may not physically assist them.
- Begin the round with a signal, such as, "Ready, Set, Go!"
- Play several rounds, with a brief discussion after each round about who was successful and why. Modify the game rules as you see fit, to get an outcome where an average of about half the calves survive each round.

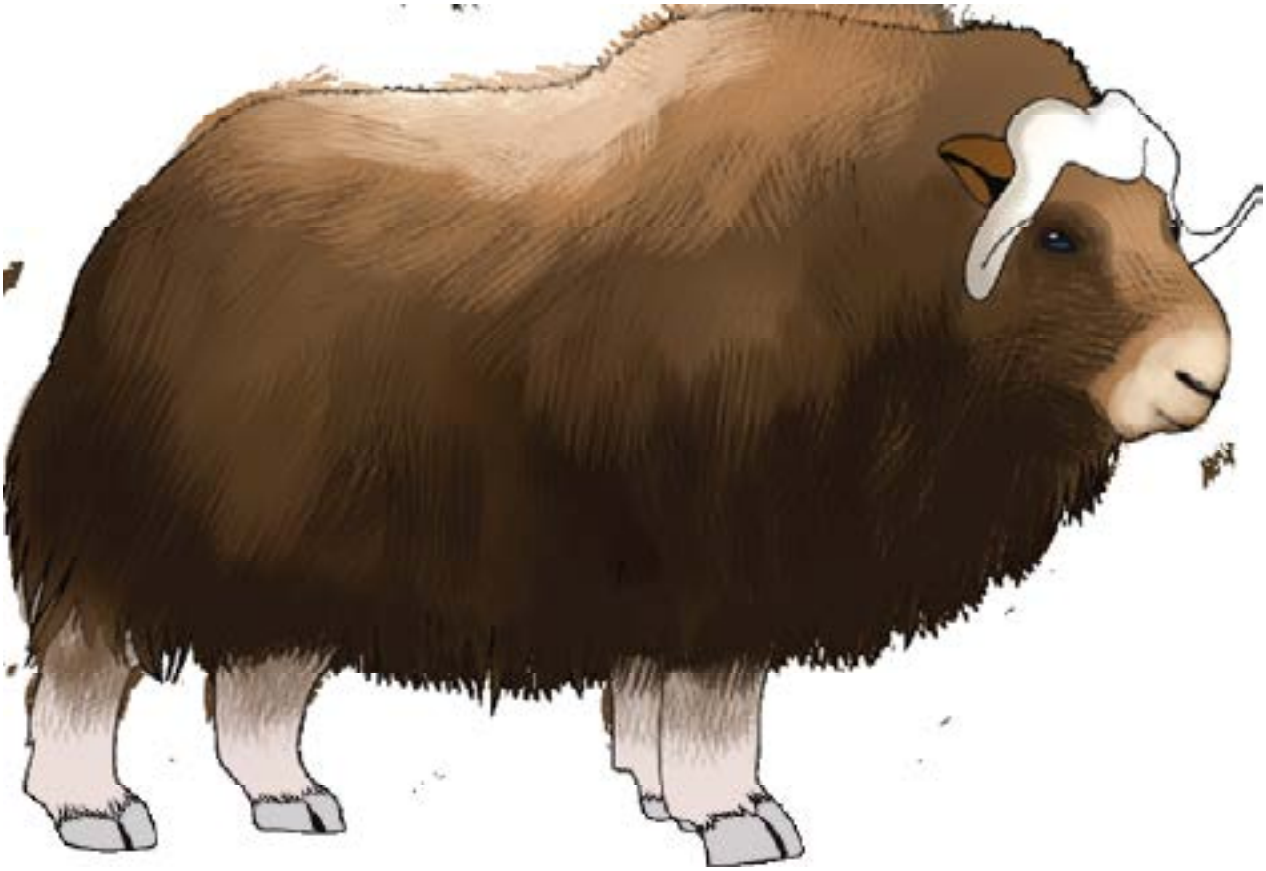
5. Discuss why these prey animals would want to live in a herd. The adage of "strength in numbers" rings true for these social animals. A female muskox will not necessarily have a calf every year; it depends on the conditions. There are not as many calves, but the herd works together to protect the calves they do have. Caribou travel in large groups and there are lots of calves. Not all of the calves will survive, but because there are so many of them, the herd will continue to thrive. (The harsh but true way to explain this is to say, "If you are a baby caribou, you don't need to be faster than the wolf, you just need to be faster than the other caribou.")
6. A caveat that students may mention is that wolves usually hunt in packs. They have their own behavioral adaptations and teamwork. For this simulation game, we had only one wolf because we had a small group of caribou and muskoxen. If we added more students as wolves, we would need many more students playing the prey role in order for them to have a fair chance at practicing their avoidance behaviors in the game.
7. Have students turn to a partner and explain how prey animals can use behavioral adaptations to avoid predators. They can also discuss if they would rather be a baby muskox or baby caribou, and why.

Extension Activity

- HSP V Investigate "Learned and Inherited Behaviors" Ch. 4 , Lesson 3
- Review or introduce the vocabulary words "instinct" and "learned behavior". Ask students if they think the calves' behavior was instinctual or learned. Record their brainstorm ideas on the board. Explain that it is both. All prey animals are born with the instinct to sense danger and fear predators. In the case of mammals, they have the instinct to seek out their mother. However, in a herd, the calves must learn who "mom" is! The bond is reinforced by scent and vocalizations, such as grunts and bellowing. But, if a calf approaches the wrong mother, she will push him or her away. Soon the calf learns which mother is theirs.

References

Pungowiyi, Perry. (2010). "Unusual Sightings." *Stories About Adaptation and Subsistence: Native Voices from the Frontlines of Climate Change*. Aksik. Accessed from: http://aksik.org/content/2010-unusual-sightings



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