

TTCD Lesson Plan (21): Energy Conservation: Migration, Insulation, & Hibernation

Unit: Energy Conservation: Migration, Insulation, & Hibernation	Grade(s): All	Class Size: 1-30	Lesson Duration: 1 hour, 15 minutes	Location(s): Classroom
Topic(s):	Migration, Insulation, Hibernation			
Student Prerequisites:	N/A			
Essential Questions:	What is an adaptation? How do different Alaskan animals use insulation, migration, and hibernation to survive?			
Student Objectives:	Students will explain how Alaskan animals stay warm using insulation, migration, and hibernation. Students will learn the Dena'ina names of common Alaska animals. Students will participate in a blubber glove experiment to learn how blubber allows animals of the Arctic and Antarctic circles to survive subfreezing air temperatures and frigid waters through their blubber.			
Standards:	Supports NGS Standards: K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive. K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats. Cultural Standards: B.4: Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life by: identify[ing] appropriate forms of technology and anticipat[ing] the consequences of their use for improving the quality of life in the community. E.2: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: understand[ing] the ecology and geography of the bioregion they inhabit;			

Local Context:	Discuss how animals local to Tyonek and Alaska stay warm during the winter using insulation, migration, and hibernation. Ask students to reflect on the behaviors of animals they have witnessed first-hand to help identify their adaptation techniques.
Vocabulary:	Adaptation: Something about a living thing, or something that a living thing does that helps it survive in its environment. Energy Conservation: Doing things to save energy. For example, riding a bike instead of driving a car, unplugging computers and other electronics at night or when not in use, or turning off the lights when you leave a room. Hibernation: When an animal goes into a deep sleep during the winter. This helps them use less energy since there isn't enough food. Insulation: Something, like fur or a jacket, that keeps heat inside. Migration: When animals move from one place to another to find better living conditions. Blubber: A thick layer of body fat that comprises up to 50% of some marine mammals.
Dena'ina language words:	Ggagga (brown bear), nut'aq'i (geese), ghenuy (caribou), quyushi (beluga)
Materials:	• A projector and internet access to present this adapted AK Energy Smart PowerPoint: Energy Conservation Powerpoint .pptx • Two large zipper lock bags (your hand should be able to fit inside) • Shortening • Spoon ∄ Duct tape ∄ Water ∄ Ice (crushed/cubes) ∄ Bucket
Instructor Prep:	Fill a one or two gallon bucket half full with cold water. Add a bunch of ice. This ice bath will be a representation of the near-freezing waters of the polar regions needed for the blubber experiment.
Introduction:	Project this PowerPoint and click through the first few definition slides while you ask the students the questions below. Energy Conservation Powerpoint .pptx As winter arrives in Alaska, the weather gets colder and the days become shorter and darker. Snow covers the ground. People begin to heat their houses and wear heavy coats outside to stay warm. Ask the class: What happens to the animals? Virtually every Alaskan animal uses some type of adaptation to conserve energy and

stay warm to survive the long, cold, Alaskan winter. This lesson focuses on migration, hibernation and insulation.

Ask the class: What is migration?

Migration: Migratory animals move between habitats during the seasons to take advantage of shelter, food, water, and climates. In Alaska, animals travel to warmer places where they can find more food before winter arrives.

Ask the class: Who can give me an example of an animal that migrates?

Birds migrate south where the weather is warmer and there is more food. Caribou migrate between habitats during summer and winter months. During the summer, they migrate to environments that provide lots of food. For many caribou herds, the summer grounds are inhospitable during the winter, so the caribou move to a winter habitat that is more agreeable (i.e. less snow cover, warmer temperatures, more available food).

Ask the class: What is hibernation?

Hibernation is a state of inactivity or a period of very deep sleep. During hibernation, an animal's body temperature lowers and its breathing and heart rate slows allowing it to use very little energy. Animals are able to survive periods of hibernation by eating extra food and storing body fat during the summer and fall months.

Ask the class: Who can give me an example of an animal that hibernates?

Bears, Arctic ground squirrel

Ask the class: What is insulation?

Something, like fur or a jacket, that keeps heat inside. Some animals grow thicker fur in the fall to stay warm during the winter.

Ask the class: Who can give me an example of an animal that insulates to stay warm?

Arctic hares and arctic foxes put on winter coats for added insulation, caribou and polar bears develop hollow hairs for extra insulation. Birds such as the snowy owl grow downy feathers. Belugas have blubber to stay warm.

Since all of these animals have adapted to overwinter, they are able to forage for food throughout the winter months, using food calories as another means to stay warm. Some animals such as the raven and certain squirrels will hide food during the summer months so they have it during the winter when food is scarce.

All three of these concepts are rooted in energy conservation, which is reducing the amount of energy we consume or use. For Alaskan animals, it involves minimizing the amount of energy they use to stay warm and to survive the winter months. Some animals conserve energy by storing food and fat during the fall months, while others conserve energy by lowering their heart rate and body temperature during hibernation.

Let the students know that we are going to play a game where an image of an animal will appear on the PowerPoint and the students will try to guess what type of animal it is and if it uses the adaptation of migration, hibernation or insulation to survive the

	winter. Once you get to the blubber slide, pause and explain the activity. Keep the PowerPoint up to return to after the blubber activity.
Activity	1. The animals of the Arctic and Antarctic circles spend their lives surviving subfreezing air temperatures and frigid water. Their secret is blubber, a thick layer of body fat that comprises up to 50% of some marine mammals. Is there any way for humans to replicate this cold-weather adaptation? With the Blubber Glove experiment, we are going to test a blubber substitute, using shortening, on a small scale and see what it's like to take a dip in cold water without turning into a human popsicle. 2. Arrange your bucket of ice water on a table at the front of the classroom so everyone can see. Fill a zipper lock bag (make sure the bag is big enough to fit your whole hand inside) with three or four heaping spoonfuls of shortening. 3. Put your hand inside a second zipper lock bag of the same size as the first and push it into the shortening-filled zipper lock bag. 4. Spread the shortening around the zipper lock bags until the inner bag is mostly covered. 5. Fold the top of the inner zipper lock bag over the top of the outer zipper lock bag, keeping the shortening between the two. Duct tape the fold in place so that the shortening does not come out of the bag. 6. Now you have a blubber-filled glove, ready to test the frigid waters of the bucket you filled earlier. Ask the students to form a line and allow each student, one at a time, to stick their hand in the glove and dip their blubber-gloved hand into the icy water.
Wrap-Up:	The shortening that we rubbed onto our gloves to represent blubber can be used to make things like cookies, fried chicken, and melted chocolate. It also worked as a great insulator. Ask the class: What did it feel like to put your hand in the cold water with the blubber glove on? Ask the class: What do you think shortening and blubber have in common? - They are both fats. Fat is really good at keeping heat in and cold out. Fats work well as insulators. Despite being submerged in incredibly cold water, fats can maintain a constant temperature. Using the Blubber Glove, your hand isn't directly exposed to the water, so the fat takes the full brunt of the cold, just as blubber insulates animals in Arctic and Antarctic waters. Returning to the PPT: Energy Conservation Powerpoint .pptx. Now that we have learned about how animals adapt to the cold, ask the class: What are some of the ways that humans have learned to survive and adapt to the cold? (give students time

	to brainstorm answers before clicking through the slides). Ask the class: What are some of the lessons humans have learned from animals to adapt to the cold? Can you think of anything from your daily life? (for example – does anyone or anyone in their family have a fur coat or fur gloves?) <i>Evidence of Learning:</i> Students are able to reflect on the new vocabulary terms they have learned - insulation, migration, and hibernation – and apply them to human behaviors, drawing conclusions on how humans adapt to the cold and learn from animals to survive the winter.
Lesson Adaptations:	Drawing / Independent Research Exercise: • After discussing each photo/slide in the PowerPoint, give each student a copy of the drawing sheet: https://akenergysmart.org/wp-content/uploads/2021/07/Thick-Coats-Sleeping-Bears_Student-Drawing-Sheet.pdf • Have each student pick an Alaskan animal, draw it, and write a sentence describing what it does to keep warm in the winter. Encourage the students to use the words: migration, insulation, or hibernation. • Ask each student to share the animal they drew and how it stays warm. Compile the student pages into a class book or display in the classroom.
Extensions:	1. Borrow a fur kit from the UAA/APU Consortium library (ARLIS section) or Fish & Game so that students can touch the furs and guess which type of animal it is. 2. Red Light/Green Light game: • Once students understand the three main tactics (insulation, hibernation, and migration), explain that you will be playing a game like red light/green light. • Play game: Students stand in a line, and teacher stands at the other end of a large room/area. Teacher shouts out “hibernate,” “insulate,” or “migrate.” • Hibernate: Students must pretend to be asleep. Cannot move forward. If they do, they have to start over. • Insulate: Students must wrap their arms around their body and try not to lose heat through excessive movement. They may shuffle forward (walk slow). • Migrate: Students are on the move! They can walk, run, or skip forward. • Time-permitting, play the game again but this time shout out an animal and see if the students can remember which strategy it uses, and then respond accordingly. 3. Blubber Glove Experiment Extension • Try using other materials following the same steps as before to find out which insulator you think works best such as ○ Butter ○ Margarine ○ Cotton balls

	○ Starch peanuts ○ Dirt or sand
Reflections:	How did it go? What did students understand most/least? What could change about instruction or lesson plan?
Resources Used:	AK Energy Smart: Thick Coats and Sleeping Bears Blubber Glove Experiment PowerPoint Presentation: Energy Conservation Powerpoint .pptx.