mystery science

Grades K-5
Seasonal Science
Mini-Lesson + Activity: “How do polar animals survive the cold?”

VIDEO TRANSCRIPT

MINI-LESSON VIDEO 1

[Video Call]

- Hi, Doug!

- Hi, Zakhar!

- I have a question for you. How do polar animals survive the cold?

- Ooh, that's a great question.

Maybe you visited or even live in a really cold place, a place that has freezing temperatures or snow, or maybe even blizzards. If you have, then you know it can be really hard to stay warm sometimes. Our body is always giving off some warmth, but in cold places, all that cold air is taking heat away from your body faster than your body can keep you warm. In fact, on some days, even our jackets aren't enough to keep the heat in to keep us warm. Now, imagine having to survive outside in the freezing snow with no jacket, no gloves, not even a winter hat. Well, for the animals who live in the areas surrounding the North and South Poles, that's exactly what they have to do every day, and it isn't easy. The polar regions are the coldest places on Earth where temperatures can fall to 90 degrees below zero. How cold is that exactly? Well, at

temperatures like that, you or I would have trouble surviving for even 10 minutes. So how do these animals do it? Before I say anything more, I'm curious, how do you think polar animals stay warm?

MINI-LESSON VIDEO 2

When discussing this question, a lot of you may have thought of fur, and you're right. Polar animals like Arctic foxes do have a lot of fur. Their fur acts like a jacket, keeping the cold air from touching their skin and trapping a warm layer of body heat around them. But just like wearing a jacket isn't warm enough for us sometimes, having a coat of fur isn't warm enough for polar animals either. It's just too cold out there. So polar animals have to rely on a lot more than just fur. Like, check out this walrus. You notice how its skin looks kind of wobbly when it moves? That's because of blubber, a thick layer of fat on their bodies that actually acts like a super warm blanket. A lot of polar animals like walruses and polar bears need that blubber to keep freezing air and icy cold water from stealing the heat from their bodies. Now you would think that staying warm is the hardest part of living in the polar regions. But surprisingly, scientists have discovered that for polar bears and walruses, staying cool is the real challenge. Really? Yes. It turns out that having all that fur and blubber works a little too well. Like, have you ever tried running around with a super warm jacket on? It can get pretty hot. That's what it's like for these animals. If they run too much or do too much physical work, they'll overheat. If you've ever noticed that it seems like these animals do a lot of just lounging around, this might explain why.

Now you might know that some polar animals don't even have for at all, like these emperor penguins. Maybe you've never looked closely at these animals before, but, let's have a look up close. Notice something? Those are actually feathers on them, not fur. They are birds, after all.

Emperor penguins live near the South Pole, the coldest place on Earth. So when it comes to keeping warm, they have to get a little creative. Notice how they're huddling and a huge group? What's going on here? These emperor penguins are huddling so that they don't freeze. The penguins on the inside of the huddle are protected from the icy winds, by the wall of penguins on the edges. Now you might be thinking, that's not really fair to the penguins on the outside of the huddle. But don't worry. Penguins have that problem covered. They take turns so that each one of them gets a chance to stay warm on the inside. Now, standing on the ice all day, even in a huddle, would be freezing. Just think of how cold your feet would be. But a Penguin's body has a solution for that too. See how they're leaning back on their heels and holding their toes up? The less of their bodies that touch the ice, the warmer they'll be. But what about the really small polar animals, like this lemming? It doesn't have a lot of fur or blubber. Could it survive in the cold? It can. It may not have any blubber, but it does know how to dig. Lemmings are masters at digging cozy tunnels under the snow. Some of them even have rest areas and bathrooms. These tunnels keep them away from the cold outside air. And lemmings aren't the only ones that build shelters in the snow. Arctic foxes, squirrels, and even polar bears curl up in holes or tunnels to stay warm. So in summary, polar animals have special ways to keep their bodies heat in and the cold polar air out. From fur to blubber to digging tunnels, or tipping back so their toes don't touch the ice. These animals have no problem surviving in the coldest places on earth. That's all for this week's question. Thanks, Zakhar for asking it. Now, after this video is done playing, my friends and I here at Mystery Science have created a special activity, where you'll design a tiny winter home that can keep you warm on a cold night. You can do this in a group or all by yourself. I hope you'll try it. Have fun and stay curious!

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to figure out how to make a warm place to sleep when you're somewhere very cold. You're going to help out Snowshoe Sisters Resort, a wilderness lodge in Alaska. Up there the days are cold and the nights are even colder. The sisters who run Snowshoe Sisters Resort want to give people an experience they will always remember in its special home away from home. What could the home look like? But maybe even more importantly, will it keep you warm? Each of the sisters has a different approach to thinking about what would make a great winter home. You are going to listen to each sister and come up with an idea based on what she tells you. Then you'll decide on one idea or maybe put a few different ideas together and you'll come up with a perfect winter home. We'll help you get started, step by step.

ACTIVITY STEP 1

Get your supplies. When you’re done with this step, click the arrow on the right.

ACTIVITY STEP 2

Take a sheet of paper and fold it in half the short way. Then, fold it in half again. Unfold it. You’ve made four boxes where you can draw.

ACTIVITY STEP 3

Number the boxes, like this. In boxes 1, 2, and 3, you’ll draw ideas you get from each sister. In box 4, you’ll think about all the possibilities and draw your final idea.

ACTIVITY STEP 4

First, you meet with sister number 1. She thinks ordinary cabins are boring! She suggests you think about a different shape for your house. She shows you pictures of triangular cabins, round domes, tiny houses on stilts, like this one, and more. Look at her pictures. In box 1, draw or write down an idea you really like. You can come up with your own idea, or choose something you like from a picture.

ACTIVITY STEP 5

Sister number 2 takes you to a snowy field and asks you to think about animals that make their homes under the snow. From above you just see a hole, but look underneath the snow and you can see where lemmings, foxes, and squirrels live. Lemmings dig tunnels to travel under the snow, arctic foxes dig under the snow and down into the ground to make a warm den, ground squirrels make an underground nest where they sleep through the winter. Think about building a house under the snow just like these animals. Draw or write your ideas in box 2.

ACTIVITY STEP 6

You can build your winter home from ordinary building supplies like wood and steel, and stone. But sister number 3 wants you to think about other materials that could help you stay warm in your home. She shows you materials the resort has lots of. Think about using cardboard to make a shelter, like this one. Or maybe you could use warm blankets, like the people in Mongolia who live in warm tents made of wooly blankets. Or you could use bubble wrap to hold bubbles of air around your home, keeping cold air away and letting sunlight shine in. And there's plenty of snow. Some people native to snowy lands stay warm in igloos built of snow. Think

about how you could use any of these materials to keep your home warm. In box 3 draw or write your ideas.

ACTIVITY STEP 7

You thought of 3 different ideas inspired by the shapes of buildings, animals homes, and possible materials. It's time to think about how you can put different ideas together, or you can choose the idea you like best. Think about why someone would want to stay in your winter home. Then in box 4 write or draw your final idea for your winter home.

ACTIVITY STEP 8

Discuss. What makes your winter home special? Why would people want to stay in it? How will it help people to stay warm?

ACTIVITY STEP 9

If you'd like, make a big picture of your winter home. Write a sentence that tells people why this home is a great home to stay in when it's cold outside.

ACTIVITY STEP 10

We suggest that younger students stop here. Older students can extend this activity by thinking about how to test their ideas by experimenting. Older students, if you're ready to start experimenting, click the arrow on the right.

ACTIVITY STEP 11

You drew your winter home—it looks great! But you don't know if the home you drew will keep you warm. If you have the time and the money, you could build the home in a very cold place and then test it. Discuss. If you built your winter home, how could you test it to see if it keeps you warm?

ACTIVITY STEP 12

Here's what we would do: We'd have one person spend the night in the home, and another spend the night outside. Then they can compare the temperature inside with the temperature outside. If your home is doing its job the person inside will stay warmer. But suppose you don't have the time and money to build your home. Discuss. How could you test your winter home without actually building it?

ACTIVITY STEP 13

When engineers want to test their ideas they make a small copy of the big thing they want to build. Then, they test the copy to see if it works. Engineers call this copy a model. Discuss. Suppose you made a model of your winter home. You would need somewhere really cold to test it. Can you think of a place in or near your home that gets really cold?

ACTIVITY STEP 14

Here's what we thought: Our freezer gets freezing cold! We could fit a small model of our winter home in there between the ice cream and the ice cubes.

ACTIVITY STEP 15

Now we'll show you how we made a model of the winter home we drew. Here's a drawing of our winter home—the Bubble House! We built a model of it by making a triangular tube from cardboard covered in waterproof tape, lining the tube with a wool sock, wrapping it in bubble wrap, and making a bubble wrap door. Discuss. If you wanted to make a model of the winter home you drew, what are some materials could you use? Spend just a minute thinking about what might work.

ACTIVITY STEP 16

If we had a full-size Bubble House, we could have real people test it out. The people are warm and we want the Bubble House to keep them warm. But real people are too big to fit in our model Bubble House. Discuss. What can we use to test our Bubble House in the freezer?

ACTIVITY STEP 17

Here's what we did: We made two tiny people—Zippy 1 and Zippy 2. Each is a Ziplock bag filled with warm water. They're warm, just like people. Zippy 1 will stay inside the Bubble House, in the freezer. Zippy 2 will be outside the house beside the ice cream sandwiches.

ACTIVITY STEP 18

So here's our experiment: We filled Zippy 1 and 2 with water at a temperature of 100 degrees Fahrenheit—about as warm as a person. We put Zippy 1 inside the Bubble House and Zippy 2 in the freezer with no protection from the cold. After an hour, we'll take Zippy 1 and 2 and check their temperatures. Discuss. What do you predict will happen? Why do you think that?

ACTIVITY STEP 19

Here are our results: First, we checked Zippy 2, who was not in the Bubble House, we opened the bag and found that Zippy 2 was frozen! Instead of water, there was ice. Poor Zippy 2!

ACTIVITY STEP 20

Then we checked on Zippy 1, who was inside the Bubble House. Zippy 1 got chilly but did not freeze. The temperature had fallen some but was nowhere near freezing. The Bubble House helped Zippy 1 stay warmer.

ACTIVITY STEP 21

Discuss. If Zippy 1 were a real person, can you think of things Zippy could do to stay warmer inside the Bubble House? Any ideas of what you could add to the Bubble House to make it stay warmer?

ACTIVITY STEP 22

Here are some things we thought a person could do to stay warmer inside the Bubble House: They could do exercises to warm up, like jumping jacks, or running in place. They could sleep inside a thick sleeping back. Or maybe they could add a fireplace inside the Bubble House. Or let a dog or cat sleep in the Bubble House with them—a furry friend adds heat to the house!

ACTIVITY STEP 23

Do you want to test the winter home you drew? If you have space in your freezer and a thermometer you could build a model and try what we did. Have fun and stay curious!