Lesson: “Can you really fry an egg on a hot sidewalk?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! It's day two of your class being stranded on a desert island. Your ship sank yesterday, and you all swam ashore. And today, man, you are so hungry. Now luckily, you spotted some wild chickens on the island. And if there are chickens, you get to thinking, maybe there are eggs around. So you look around and yes, all right, a nest! All right, you've got some eggs. Now, you don't really want to eat raw eggs if you don't have to. That'd be kind of gross. It would be nice to find a way to cook them. There isn't any fire on your island, but it is really hot outside. It's so hot, actually, that it reminds you of something your uncle used to say every time it was a hot day. He'd say, “It's so hot outside you could fry an egg on the sidewalk!” You always thought that was just a funny thing some people say when it's hot outside. But could that expression actually be true? That would solve your problem. So you think, well, maybe I could try it out. There are no sidewalks on this island, but there is a nice flat rock that's been sitting in the hot Sun. So you go ahead and you crack open one of the eggs, like this. Here's what happens. Hm, it doesn't fry. It's still just a raw egg. I guess maybe the saying isn't true. Or does it just need to be hotter outside? It turns out that people have tried doing this even in the hottest place on Earth. That's this place right here, Death Valley, California, in the USA. Summer temperatures there reach 134 degrees Fahrenheit. So if there were somewhere that frying an egg on a hot sidewalk should work, Death Valley is the place. Look what happened even there

though. It still doesn't work. The eggs are still raw. So if it doesn't work in the hottest place on Earth, it's not going to work on this desert island either. Unfortunately, then, it seems like there isn't a way to fry an egg on a hot day, hm. Now, meanwhile, while you were busy trying to fry an egg, your friend was busy rubbing some sticks together. And she managed to start a fire. All right! She even found this chunk of metal from the ship that can act like a frying pan. What an awesome friend. What would you do without her? You're all in business. You guys are going to have some fried eggs, woohoo! But now you have a new problem. You know that that hot pan will burn your fingers if you touch it. You don't have any easy way to get your hot pan off of the fire without burning your hand. What can you do? You want to grab the pan, but it's too hot. Well, think about what people normally use in situations like this so that they won't burn their fingers. Like what would you use to get a hot dish out of the oven?

EXPLORATION VIDEO 2

So an oven mitt and a cup sleeve are both objects that we use to pick up hot things. But look at the materials they're made out of. An oven mitt is made of thick cloth. The sleeve on a paper cup is made out of cardboard. Cloth and cardboard are different materials, but both have the same property. They don't let heat get through them very easily. That's why these materials protect you from getting burned. Scientists have a single word that they like to use for this property. They say that these materials have insulating property. Materials that have insulating property don't let the heat get through easily, and so that protects you from getting burned. So now you have your solution for how to lift the hot frying pan off of the fire without burning your hand. What you need is a thick piece of cloth or cardboard. But you don't have a thick piece of cloth or cardboard here on the island. All you have on the island are these materials that

washed up on shore. Will any of these materials work? You really don't want to burn your hand to find out. How can you find out which materials have insulating property?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to make mittens out of different materials. Then you're going to use those mittens as oven mitts to find out which have insulating property. In other words, which materials can help you pick up something hot, like a frying pan, without burning yourself. Now you wouldn't want to test your mittens by grabbing an actual hot pan, because some of the mittens might not work and then you'd actually burn yourself. Ouch. So instead, you're going to use a bottle of water that's been heated up. Some of the bottles are hot, but some of them are not. Can you feel the heat? You're going to try out all of the materials to see if they're insulating to see whether you can feel the heat or not. Are you ready? I'll walk you through how to do this experiment step by step.

ACTIVITY STEP 1

Find a partner to work with. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Get these supplies for your group. You'll get the water bottles later.

ACTIVITY STEP 3

To make foil mittens, put your hand on the foil and have your partner fold it, like this. You'll make two mittens total.

ACTIVITY STEP 4

Your teacher will give each table of students two bottles of water. One's hot and one's cold. You may have to share these bottles with another pair of students, so you'll be taking turns.

ACTIVITY STEP 5

We'll do number one on the worksheet together. Have one partner put on the aluminum foil mittens and close their eyes.

ACTIVITY STEP 6

When their eyes are closed, hand them the bottles one by one, like this. Can they tell the bottles apart? When that person is done, switch jobs so both people can try.

ACTIVITY STEP 7

Answer question number one on your worksheet.

ACTIVITY STEP 8

Now try this with socks, then with Styrofoam cups. Then finish the worksheet. Make sure both people get to test out all of the mittens.

ACTIVITY STEP 9

Discuss these questions as a class. Afterward, click the arrow on the right to watch the final video.

WRAP-UP VIDEO

When you wore the Styrofoam mittens, you couldn't feel the heat of the hot bottle at all. That's because Styrofoam is a material that has insulating property. Heat doesn't move through Styrofoam quickly or easily. When you used cloth socks as mittens, you probably could feel some heat. Cloth is insulating. That's why people use it for oven mitts, but it's not nearly as good at insulating as Styrofoam is. To protect your hands from hot things with a cloth sock, you just need cloth that's thicker, like this super thick hiking sock. OK, and now the aluminum mittens. When you use mittens made of aluminum, which is a metal, it doesn't protect you from heat. It isn't insulating. When you press the aluminum metal against the bottle, heat from the bottle moves into the aluminum and travels into your hand. That isn't good for oven mitts. In fact, aluminum and other metals actually have the opposite property from insulating. They have the property called conducting, which means that heat goes through them very easily. Conducting materials like metal make really bad oven mitts. Only insulating materials will protect you from hot stuff. Conducting materials are good for something else, though. Like, have you ever noticed that pots and pans are all made out of metal? Why is that? Well, when you put a metal pan over a fire, the heat of the fire travels quickly through the metal into the food you want to cook. Because the metal is conducting, it passes that heat along to the food. Now that you know this, I can let you in on a little secret. Remember before how we asked, can you fry an egg on a sidewalk? And it seemed like the answer was no. Well, actually, it is possible. This person is putting a metal frying pan down on the road outside his house. He left it out in the sun for hours on a really hot day. The pan got hot and look at what happens when he cracks an egg into that hot metal pan. Ah-ha! It fries. The egg turns white, so it worked. When we did this earlier on a

rock, the egg didn't cook, remember? The rock was hot, but all the heat didn't get to the egg. That's because rock has insulating property. It's not a good conducting material. But when you put an egg on metal, it works because metal has conducting property. It lets the heat travel through. So it is possible to fry an egg on a hot day with a little bit of cleverness and by thinking about the properties of materials. Now that you know how to protect your hands, it's time to eat— so go enjoy your imaginary desert island egg breakfast all without burning your hands.