mystery science

Lesson: “How could you warm up a frozen playground?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! Summertime. Summertime is such a fun season, isn't it? When I was a kid, I loved summer. During the summer, I spent a lot of time outside, and I got to go swimming at the pool. On a hot day, nothing was better than a cool swim. When I got out of the pool, I could sit in the sunlight to warm up. The sun would shine brightly, sometimes so brightly that I got too hot and it would be uncomfortable. So I'd move into the shade, where it was cooler. Sometimes at the pool on a really hot day, the pavement would soak up the heat from the sun. If I tried to walk on the pavement with bare feet — *oww*. It hurt my feet to walk on. Now, I grew up near the city of Chicago, and it got pretty hot there. But some places get even hotter in the summer. For example, there is a city called Phoenix, Arizona, in the United States that got so hot in the summer of 2017 that plastic trash cans started to melt. I'm not making this up. It was so hot that paint was melting off the street signs. One person took a picture driving to work wearing oven mitts to keep from burning her hands on the steering wheel of her car. Another person was actually able to bake cookies in his car. Hopefully it doesn't get as hot as this where you live, but you've probably still experienced hot things in the summer. What are some of the things you've noticed that get really hot in the sun?

EXPLORATION VIDEO 2

In the hot summer, the challenge is to stay cool. Usually, we want to get out of the sun's heat in the summer, like by sitting in the shade. But in other seasons, we might want to get into the sun's heat, especially in winter when it gets cold. Then, you definitely wouldn't want to be in the shade. But what if you were stuck in the shade? Well, let me tell you a story about a town that is always in the shade in winter time. This takes place in a small town in the country of Norway. Norway gets very cold in winter, and this little town gets especially cold. It's at the bottom of a valley, and the mountains around the town block the sun for long parts of the day during the winter. There was a person living in this town who was an artist and inventor, someone who comes up with new ideas. He noticed that people in the town really missed seeing the sun and were sad that they couldn't enjoy the sun's heat at all during the winter. At the center of the town, the town square, it was covered in snow and ice. No one in the town wanted to spend time there because it was so cold. The inventor wanted people to be able to enjoy being outside in the winter. He couldn't move the town since it was already built, and he couldn't move the sun itself. But he wondered: could he move the sunshine to the town? What would you do if you were this inventor? How could you bring the sun's light and heat to this town in the winter?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to figure out how to use sunshine to warm up a place we call Chill City. Just like the real city we've been talking about, Chill City has mountains around it. All winter long, mountains block the sun so that no light shines on this city. The people who live here are cold. All winter long, it's too cold for the students to go out and play in the school playground. That playground needs some sunlight to warm it up. That's where you come in. It's

your job to bring sunshine to the playground in Chill City. Now, you don't have a real city to experiment with. Instead, you'll make a model city — that's a pretend city that you can use for experimenting. Your model city, and the mountains around it, are made out of paper. The sunshine is light from an electric lamp. But even though the city isn't real, it can help you discover solutions that could help a real city get warm. You and a partner are going to set up your city and figure out how to get sunlight onto the playground in Chill City to warm it up. I'll show you how to get started, 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 your supplies.

ACTIVITY STEP 3

Line up your ruler with the dotted line. Then fold your Chill City sheet like this. Run your fingernail over the fold to make sure it's folded really well. It should look like this when you're done.

ACTIVITY STEP 4

If your mountains aren't standing up, try folding again. You can also pinch the middle of your paper like this. Go to the next step when your mountains are standing tall.

ACTIVITY STEP 5

Turn off the overhead lights. Turn on the lamp that will be the sun. If you're in a large group or class, there may be more than one lamp.

ACTIVITY STEP 6

Turn your city so that the mountains cast a shadow, putting Chill City in the shade. Then, use stickers to tape your city in place, like this. You'll want to pay attention to your shadow too. Make sure you don't block the light.

ACTIVITY STEP 7

Find the Chill City playground. It's marked with the letter P. It's your job to warm up that playground. Once you find the playground, go to the next step.

ACTIVITY STEP 8

Take everything out of the envelope and look at what you've got.

ACTIVITY STEP 9

Make sunlight shine on the playground using the supplies from your envelope. It won't be easy. Try out different ideas — that's called experimenting. You can bend stuff, you can fold stuff, you can cut stuff. Once you get some light on the playground, see if you can make it even brighter. Remember, you can't move the lamp and you can't move the city.

ACTIVITY STEP 10

Now that you've figured out how to warm up the playground, find the town square. It's marked with the letter S. Use your supplies to make the sunlight shine on the town square.

ACTIVITY STEP 11

Find the ice rink. It's marked with the letter R. Can you make light shine on the playground and the town square, but not on the ice rink?

ACTIVITY STEP 12

Discuss.

ACTIVITY STEP 13

Get a Draw Chill City sheet. Draw what you would build to keep the playground warm in winter. The grey part is the shadow cast by the mountain.

ACTIVITY STEP 14

If you're in a class and you have time, compare your drawing with other people's drawings. Then, advance the slide to watch the final video.

WRAP-UP VIDEO

So, did you figure out a way to get sunlight to your paper model of Chill City? Maybe you found out that you could use shiny material like this aluminum foil to shine light down onto Chill City.

You could take a flat piece of shiny foil and reflect it over a big area of the town — that way you could bring some sunlight to the town square and the playground at the same time. Or maybe you discovered that bending a flat piece of shiny foil could make one spot a lot brighter and warmer. Then you could take that bright spot of sunlight and shine it on the town square or on the playground, but just not both at the same time. And maybe you tried something really different, like this. We found out that our piece of clear plastic worked almost as well as the shiny foil, so we used that to warm up the town too. Notice how there's more than one way to solve the problem? That's often true when you're solving problems. There's almost always more than one way to solve a problem. Now, what about in real life? I mentioned that this was a real town in a real place in Norway, and that there was an inventor who was trying to solve the problem of getting more light and warmth to the town in winter. So, what did the inventor do? Well, just like you noticed in the activity, the inventor noticed that shiny things, like aluminum foil, take light and shine it to another spot. The inventor knew that a mirror was a good example of this. A mirror could do this too. So, he came up with a plan, a way to collect the sun's heat and warm the town. This was his plan: He put a bunch of large mirrors at the top of one of the mountains surrounding the town. He turned the mirrors just right to shine the sun's light down to the town. Now light and heat from the sun could reach the town, but just in one spot in the town: the town square. See, here's what it looks like. It was perfect. Here's what the town square looked like from the sky above the town. People came to the town square for a party in the sun. They even set up a sand volleyball game and lounge chairs for sunbathing. The inventor had come up with a solution to bring sunlight to the part of the town during the cold, dark winter. Sometimes it seems like there's no way to solve a problem. Imagine how people in that town felt before the inventor came up with this solution. Many of them must have thought, there's no way you can bring the sun to us. Sometimes it can seem like there's no way, but if you think like an

inventor, you say to yourself: there must be some way. And sure enough, you can almost always come up with some way to solve a problem. What problems in your town might you be able to solve if you think like an inventor? Think about that. Have fun and stay curious!