Lesson: “Could a statue's shadow move?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! I want you to think back to when you were just a little kid. Maybe you don't even remember it that well, you were so young. And when you were learning to walk, at some point, walking around, you looked down and you noticed, for the first time, this—your shadow! It's all dark, and it seems to keep following you everywhere you go. Some little kids are even scared of their shadow when they see it. And it's not just kids who notice their shadow for the first time. Look at this. This dog is noticing its shadow and it seems to want to chase it away. I guess shadows are a little scary. They're dark and they keep following you. As we get older, we all figure out that our shadow isn't something to be scared of. Your shadow is not something you can ever get away from. There's no leaving your shadow behind. Your shadow moves because you move. But could the shadows of other things move? I mean, things that aren't alive, like a building shadow. Could it move? Or the shadow of the fence. Or the shadow of this statue. Could a statue shadow move? Maybe you're thinking, no way, the only way a shadow would move would be if the thing itself moved—and a statue doesn't move. But if the statue moved, now, is that the only way for its shadow to move? Could there be another way? I have an idea about how we could find out. Now, sadly, I don't have any great big statues near me. But here in the office of Mystery Science, where I work, we do have this little gnome. And he makes a good statue. His name is Willy. My friend is going to put Willy in the sun, where he makes a shadow.

You see his shadow here? My friend is also going to trace Willy's shadow on a piece of paper, so we'll know if his shadow moves. Now, let's leave Willy here for a while. We'll come back and check later to see what happens. While we wait, though, I have a question for you. I sent it to your teacher so that you can read the question together.

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to experiment with shadows, using a flashlight, a shadow pattern page, and a paper version of Willy the gnome. You're going to give Willy a shadow, and then figure out how to make his shadow move, so that it lands on each shadow that's drawn on the page. There are numbers on the shadows, so you have to do them in order, making Willy's shadow move so that it covers number one, number two, and number three. You can't move Willy. He's going to be taped to the page. And the page is going to be taped down as well, so you have to figure out some other way to make Willy's shadow move. Can you figure out how to make all the shadows on each pattern? And can you move through the numbers in order, moving from one shadow to another? Those are your challenges for today. If you have a group of people, you'll work in teams, at stations. Then afterwards, you'll talk about what you learned. All right, ready? I'll show you what to do, step by step.

ACTIVITY STEP 1

If you're in a class, you need to form a group for each station. If you're working alone, you can do each station on your own. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Turn off the lights, so the room is dark.

ACTIVITY STEP 3

Go to a station. If you're in a group, take turns making the shadow patterns. When you're done, go to another station. When you've done enough stations, then go to the next slide.

ACTIVITY STEP 4

Discuss this question.

ACTIVITY STEP 5

Take a look at the sunny spot where you marked the shadow. What happened? If you didn't do this experiment, look at the next slide to see what happened in our experiment.

ACTIVITY STEP 6

Watch this video of our experiment. What happens? This video has been sped up so that 20 minutes goes by in just 20 seconds.

ACTIVITY STEP 7

Discuss this question.

WRAP-UP VIDEO

We make our own shadows move by moving our bodies, like if we moved our hand side to side like this. But that's not the only way for a shadow to move. If you keep your hand still and the light moves instead, then a shadow can move too. At your activity stations, you were able to

make the gnome shadow move, even though the gnome wasn't moving. You did that by moving the light. You moved the flashlight you were holding. When I marked the shadow of this statue by the window, it didn't seem like the gnome's shadow was moving. But if we watch it slowly over time, we can see that it is moving very, very slowly. Look, you see that? It's moving. That's because the light is moving. In other words, the sun seems to be moving. And it's not just statute shadows that move. Have you ever noticed this with other things? Check out another video. This is a sped-up video of some trees outside. Hm. And here's the view inside of a room, if we speed up the video, all day. All of these shadows are moving because of what the sun is doing. The sun seems to be moving in the sky. Look. Here's a sped-up video of what the sun is doing. Now, you already knew the sun rises in the morning and sets in the evening. But even in the middle of the day, the sun's place in the sky is changing. This shadow experiment proves it. This experiment shows you that once the sun comes up, the sun doesn't just stay in one spot in the sky. It moves. It turns out, scientists discovered something that may sound kind of crazy. It's actually the Earth that's moving—not the sun. But when you're standing on the Earth, as we do, it looks like the sun is moving. So we find it helpful to talk as if that's true. We say things like, the sun is rising or, in this case, the sun is setting or the sun moves across the sky. So, in summary, you found out that a statue shadow can move. That's because the sun doesn't stay in one spot in the sky. It looks like it's moving across the sky. And that makes all the shadows on the ground move too, even the shadows of statues and buildings. We'll explore more about the sun in our next Mystery. Have fun and stay curious!