mystery science

Grades K-5
Mini-Lesson + Activity: “Why does it get dark during a solar eclipse?”

VIDEO TRANSCRIPT

MINI-LESSON VIDEO 1

Hey, it's Jay. Growing up in Wisconsin, it sometimes snowed a lot. When it did, we'd wait for two magic words. Snow Day. That meant no school. On April 8th, 2024, some schools are closing because an unusual event is happening outside. But it's not a snow day. Some schools are closing because crowds of people will be visiting their area. They're looking forward to an experience that hasn't happened in some of these place for hundreds of years. Check it out. For a short time that day, the Sun will look like this. That's a total solar eclipse. Someone named Marshall is curious about solar eclipses. Let's give Marshall a call now.

[Video Call]

- Hi, Jay!
- Hi, Marshall!
- I have a question for you. Why does it get dark during solar eclipse?
- Oh, that's a great question.

Have you ever been playing outside on a sunny day when suddenly it gets darker? That probably got your attention. After all, you know the light outside comes from the Sun, and there isn't some giant light switch turning it off and on, Instead, you might see that storm clouds are rolling in, or maybe it's more surprising, like something flying overhead. Whatever it is, for a

moment, it blocks some of the Sun's light. It's like when you do this, your hands block some of the light and cast a dark shape on the wall, a shadow. Maybe you've experimented with your shadow before. On the playground, I like to see how big I could make mine and how much it could cover. This skyscraper shadow stretches for blocks. And this mountain shadow is massive. Up in a plane, you can see the huge shadows that clouds cast down below. Before I go on, I'm curious. What's the biggest shadow you've ever seen?

MINI-LESSON VIDEO 2

I'm not sure how you answered, but I wonder if you've ever seen a shadow so big that scientists study it. A shadow so big that people travel to see it. So big, it closes school for the day. Maybe you see where I'm going with this. If you know about eclipses, you might already know that the Moon travels around the Earth. As it goes around, it passes in between the Earth and the Sun. And sometimes, for a short time, the Moon blocks the Sun's light. That's what causes a solar eclipse. The dark circle you see here is the Moon. This is what a total solar eclipse looks like from Earth. But let me show you what it looks like from space. There's planet Earth. And see this dark patch? This is actually the Moon's shadow. Just like your hands make a shadow, the Moon makes a shadow when it blocks the sun. In fact, the Moon's shadow is why it gets dark during a total solar eclipse. Over here or over here, it's still pretty bright. It only gets really dark in places covered by the darkest part of the shadow, roughly the area circled here. Now, compared to all of planet Earth, that shadow is small, especially the darkest part. And as this video shows, the Moon's shadow moves. It doesn't stay in one place for long. Plus, the Moon's shadow might follow a path over here during one solar eclipse but be here out over the ocean during another. So, you need to be in just the right place at just the right time to be in that shadow. And that's what makes it so special and rare to experience a solar eclipse. That's why

people are traveling from all around for a chance to be in the moon's shadow. It gets dark in the shadow, but not pitch black. There's actually a lot to notice during an eclipse. Of course, like any day, bright sunlight can hurt your eyes, so you need special glasses like these to protect them if you want to look up at the Sun during parts of the eclipse. First, you'll see this. Kind of looks like someone took a bite out of the Sun. That's actually the Moon starting to pass in front. And check this out. When beams of sunlight shine between the leaves of the tree and hit the ground, you might notice funky shapes. Almost like each beam of light has a bite taken out too. If you're in the outer parts of the Moon's shadow, you'll see the Moon cover part of the Sun as it passes by. That's a partial eclipse. But if you're lucky enough to be in the path of a total eclipse, you'll see that bite get bigger. And as it does, it gets darker. Just before the last bite, you might spot this. That's one dazzling sunbeam. Some people call this the diamond ring. And then, woah. It's totally blocked by the Moon. You're finally in the darkest part of the Moon's shadow. This is the moment when people can safely take off those glasses to take it all in. It's daytime, but the sky looks like sunset as if it's suddenly evening. The air will feel cooler, and you might hear this. Those are crickets making their evening sounds. Other animals might act like it's evening too. The Moon keeps moving, so you're only in the darkest part of its shadow for a few minutes. But people who have experienced this say it's unforgettable. Just listen to this crowd reacting to a total eclipse. So, in summary, it gets dark during a solar eclipse because the Moon blocks the Sun's light and casts a shadow onto part of the Earth. But you can only see a total solar eclipse and experience that darkness if you're in the darkest part of the Moon's shadow. I hope that you'll have a chance to be in that shadow someday and have the special experience of seeing a partial or total eclipse for yourself. Remember that you'll need special glasses like these to protect your eyes if you want to look at the Sun during parts of an eclipse. Or for another safe way to watch an eclipse, we've put together a step-by-step activity that uses paper to create an

eclipse viewer. Check it out after this video is done playing. That's all for this week's question. Thanks, Marshall, for asking it.

ACTIVITY INTRODUCTION VIDEO

In today's activity, I'm going to show you how you can use two pieces of paper to watch the solar eclipse. Now this won't let you look directly at the sun. That's dangerous and can damage your eyesight unless you have those special eclipse classes. What I'm going to show you is a different way to see the sun. Without actually having to look up at it. Instead, you and a friend are going to look down at a piece of paper to see what's happening. I know this sounds weird, but it really works. When the eclipse is happening and the moon is starting to block the sun, you'll get to see the same thing on your paper. What I'm going to show you is a way to project an image of the sun onto a piece of paper so that it's safe to look at. This is called a pinhole projector. And it will let you see what's happening in the sky without having to look directly at the sun. All right. Let's make one. It's easy. I'll show you how to get started, step by step.

ACTIVITY STEP 1

Find a partner. Decide who will be the Sun Master and who will be the Tilt Master. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Get your supplies. Each group needs one Tilt Sheet, one Hole Sheet, and a pair of scissors.

ACTIVITY STEP 3

Tilt Master: you're in charge of the Tilt Sheet. It's ready to use. Sun Master: you need to fold the whole sheet in half on the dotted line. Just line up the edges of your paper and press down with your finger to make a crease. Then, cut out the black triangle. Now, when you unfold it, you should have a small square hole in the middle. Now your sheet is ready to use too.

ACTIVITY STEP 4

Watch this step so you know what to do when you go outside. Don't do anything yet, just watch. Okay, Tilt Master: first, you'll find where the Sun is in the sky. Just look for your shadow. The Sun is in the opposite direction. You'll sit down and you'll tilt your sheet toward the Sun. You'll stay there just like that while you watch the eclipse. Now, Sun Master: you'll hold your sheet above the tilt sheet. Lift it up closer to the Sun, like this. Now, doing this will make a picture of the real Sun appear on the tilt sheet. Now that you both know what to do, let me show you a closer view. When the paper is held close, you'll see a square or a diamond shape on the Tilt Sheet. But as you pull the whole sheet away, notice it becomes a circle. It becomes a real picture of the Sun. While the eclipse is happening, you'll see the Sun really change shape as the Moon passes over it. Okay, now that you know your job, go to the next slide and we'll practice indoors.

ACTIVITY STEP 5

Let's practice! Pretend the Sun is directly above you on the ceiling. Tilt Master: sit on the floor. Tilt your Tilt Sheet up towards the Sun. Okay, Sun Master: put your Hole Sheet above the Tilt

Sheet, and lift it up closer to the Sun. All right, good job; you're done practicing. You can take a seat.

ACTIVITY STEP 6

If you can't remember what to do when you go outside, look at the instructions printed on your paper. Whether you're going to see a partial eclipse or a total eclipse, I hope you have an amazing time. It's not every day you get to see the Moon pass in front of the Sun. Have fun and stay curious!