Lesson: “When can you see the full moon?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hey, it's Jay from the Mystery Science team. I've been thinking about the Moon. One thing I love about the Moon is that no matter where in the world you are, everyone sees the same Moon in the night sky. I live in Florida. If I look out my window at night and see this—a round, full moon–I can call my family members who live in Texas and tell them to look at the sky that night. And even though they're miles and miles away, we'll see the same full moon. I could even call my friends who live on the other side of the world in Australia and tell them to look at the sky at night, and they'd see the same full moon. And it's a good thing, too, because when it's shining in the sky, a full moon is amazing to see. Maybe you've heard stories about magical things that happen under the silvery light of the full moon, like fairies dancing in forests or humans transforming into werewolves. Now, those are just stories. Those things don't really happen, but there are plenty of other things that are more likely to happen when there's a full moon. Like, check this out. This plant is sometimes called a werewolf plant because of how it changes during the full moon. When the full moon is out at night, the plant releases these droplets of liquid to attract bugs; they kind of look like tears. And this sea bird does something more dramatic during the full moon. These birds gather in huge flocks, almost like a full moon party. Humans sometimes gather to celebrate the full moon as well. For example, millions of people in

Chinese and Vietnamese communities celebrate the Mid-Autumn Festival near when the full moon appears in mid-autumn. It's also called the Moon Festival. People celebrate the Moon Festival in all kinds of ways, including making bright paper lanterns and eating special sweets called mooncakes. Many other cultures celebrate full moon holidays, too, each with their own special foods, stories, and traditions. And even if it's not a special day or a holiday, many people just like to do things outside on nights when there's a full moon. The full moon reflects a lot of light. When the sky is clear, a full moon lights up the night sky and the earth below with silvery light. All that reflected light makes it easier to see outside at night. So a full moon is an extra good time to go on a nighttime nature walk or just stand outside and look at the Moon. But there's something else that makes a full moon special: it's kind of rare. When there's a full moon, it looks like this—a full, round circle. Let's take a closer look at the Moon together. How can you show a big, round shape like that using your arms?

EXPLORATION VIDEO 2

The Moon can look like many different shapes. Sometimes the Moon looks like this, a full moon. But sometimes it looks like this instead—a shape like the letter “C,” or a sliver of a fingernail. And other times, the Moon looks like this—like the letter “D,” or a half circle. Sometimes the Moon doesn't look like any of these shapes, but instead looks like this funny in-between shape. This one is kind of tricky to make with your arms. And sometimes the Moon even looks like it disappears completely. This one's even trickier to show with your arms. This is what we did. Even on nights when it looks like the Moon has disappeared completely, the Moon is actually still there. It's just not reflecting any light. During a full moon, a whole side of the Moon is lit up with light from the Sun, so it looks like a complete circle. But sometimes only part of the Moon is lit up by sunlight, while the rest is hidden in dark shadow. We can see the part that's lit up, but

we can't see the rest too well because it's in the dark. When we only see a sliver of the Moon; we call that a crescent moon. When we only see about half of a circle, like this, some people call that a half moon. And of course, when we see a full circle lit up, that's called a full moon. So here's what I'm wondering. If the full moon is just one of many different moon shapes we might see in the sky at night, how do we know when the full moon is going to appear? Some events are hard to predict because we have no way of judging when they will or won't happen. If you flip a coin, for instance, there's not a great way to tell whether it will land on heads or tails. It's a surprise every time. But some events are easy to predict because they happen the same way over and over again on the same schedule. You probably have some events like this in your life. Like, if you go to school, maybe your school day starts at the same time every day. Maybe your school year starts in the fall and ends in the summer every year. Maybe you always have school on Mondays, but never have school on Sundays, week after week after week. Maybe you've noticed other things in your life, or in the world around you, that happen this way. What other events repeat over and over again on the same schedule each time?

EXPLORATION VIDEO 3

Maybe you've noticed that lots of things in your life repeat on the same schedule, even outside of school. Like the days of the week always go in order—Monday, Tuesday, Wednesday, and so on, until it gets back to Monday again. Or maybe you remember that your birthday happens on the same day every year. In science we sometimes call something that repeats over and over again in the same order a cycle. Lots of things in nature follow cycles. You might know, for example, that the Sun has a cycle that happens every day. The Sun rises—we call this the morning—then sets—we call this night—then rises the next morning, then sets that night, day after day after day. That's the Sun's daily cycle. The Moon and the Sun are similar in a lot of

ways. They're both big, round objects that light up the sky. They both appear to move across the sky as time passes. But the Moon and the Sun are also different in a lot of ways. While the Sun usually shows up in the same shape, the Moon looks like it's different shapes on different nights. The Sun shines with its own bright light, while the Moon only reflects some of the Sun's light and sometimes it even looks completely dark. So I'm curious if the Moon’s shape changes in a cycle that repeats over and over on the same schedule. Imagine you're planning a camping trip. You want to go on a nature walk during the full moon when there will be the most moonlight to see by. How do you know the next full moon will happen? If the full moon appears on a cycle, then you can use that cycle to figure out when the next full moon will be. But does the Moon work that way? Suppose we watch the Moon night after night. Do you think you'd see the Moon’s shape change in a cycle? Why or why not?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to make your very own Moon Book. Then, you'll watch the Moon night after night and draw what it looks like in your Moon Book. When you're done, you can use your Moon Book to figure out whether the Moon's shape changes in a cycle. Maybe you're thinking, "It's going to take a long time to finish my Moon Book if I have to look at the Moon night after night." But we've made that easy for you. We took photos of the Moon every few nights for a month. You can look at our photos of the Moon and draw those moon shapes in your Moon Book one by one. When you're done, maybe you can use your Moon Book to predict when the Moon will be full. If you could do that, you'd know the perfect night for a nature hike under the full moon. Are you ready to make your Moon Book and learn the secrets of changing moon shapes? I'll get you started, step by step.

ACTIVITY STEP 1

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

ACTIVITY STEP 2

Find a partner. You and your partner will help each other make your Moon Books.

ACTIVITY STEP 3

Cut on the solid, black line on your Moon Book sheet. When you're done, you'll have two equal pieces.

ACTIVITY STEP 4

Flip both pieces of your Moon Book over. Fold each piece in half, like this, so that the words are on the outside. Make sure to line up the corners and edges before you fold. Run your finger along the fold to make a good crease.

ACTIVITY STEP 5

One folded paper has a triangle on it. The other one has a star. Turn the paper so you can see the triangle and the star. Set the papers on your table, like this.

ACTIVITY STEP 6

Fold each paper in half, like a book. Be sure to match up the corners and run your finger over the fold. After you have folded them, unfold them both, like this. Have your partner check to make sure your folded papers look just like ours.

ACTIVITY STEP 7

Find the paper that has a star on it. Set it on top of the paper that has a triangle on it, like this.

ACTIVITY STEP 8

Now you'll use the pipe cleaner to hold your book together. Bring the ends of your pipe cleaner together to make a loop, then squeeze the sides of the loop together. You folded your pipe cleaner in half.

ACTIVITY STEP 9

This step is a little tricky. Take turns helping each other. Have your partner hold your book open so you can see the star. Slide one half of the pipe cleaner into the middle of the book. It will be between pages four and five. The other half is on the outside. Twist the ends of the pipe cleaner together.

ACTIVITY STEP 10

Write your name on the front of your book. Now you're ready to watch the Moon and draw pictures of its shapes in your book. That will help you remember all the moon shapes and when they appear.

ACTIVITY STEP 11

To help you complete your Moon Book, we took photos of the Moon night after night. We started when the Moon was full. Here's our first photo. The full moon is round and bright. Look at the white circle on page one of your Moon Book. Let's outline the shape of the full moon. With your pencil, draw a line on the edge of the circle, like this.

ACTIVITY STEP 12

A few days after the full moon, we took this photo. The Moon doesn't look round anymore. That's because part of the Moon is in the dark. You can't see the dark part, so the Moon looks like it's a different shape. Turn to page two in your Moon Book. Use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of the Moon that's dark.

ACTIVITY STEP 13

Here's the photo we took a few days later. Now half of the Moon is in the dark. The part of the Moon that's bright looks like only half of a Moon. On page three of your Moon Book, use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of

the Moon that's dark. When you're done, make sure the Moon in your book looks like the Moon in our photo.

ACTIVITY STEP 14

Here's the photo we took a few days later. Most of the Moon is dark. All you can see is a curved sliver of the Moon. This is called a crescent moon. On page four of your Moon Book, use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of the Moon that's dark. Make sure the shape of the Moon in your book matches the shape of the Moon in our photo.

ACTIVITY STEP 15

Here's the photo we took a few days later. This is the strangest moon shape of all. The Moon is dark. The Moon is still there, but it looks like no Moon at all. On page five of your Moon Book, use your pencil to shade in the whole Moon so it looks like our photo.

ACTIVITY STEP 16

You'll see the rest of our photos in a bit, but now it's time to use your Moon Book to see what's happened with the Moon so far. Start on page one, where you drew the full moon. Look at the Moon's shapes on page two, page three, page four, and page five. Discuss what happened to the shape of the Moon as the days went by.

ACTIVITY STEP 17

Here's what we noticed. In the two weeks after the full moon, the bright part of the Moon got smaller and smaller as the days went by. The Moon went from a bright circle to a half moon to a crescent, and now it's completely dark. Discuss: What do you think the Moon will look like next?

ACTIVITY STEP 18

Here's what happened next. A few days later, we took this photo. It's a crescent moon again. But wait a minute, compare this moon shape to the one you already drew on page four. Discuss: How is this moon shape like the one on page four? How is it different?

ACTIVITY STEP 19

In our photo, the bright part of the Moon is the same shape as page four, but it's facing the other direction. Looking at the picture you drew makes it easy to see how these moon shapes are both the same and different. On page six of your Moon Book, use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of the Moon that's dark.

ACTIVITY STEP 20

Here's the photo we took a few days later. It's the half moon again, but this time, the bright half is on the other side. On page seven, use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of the Moon that's dark.

ACTIVITY STEP 21

Here's the photo we took a few days later. It's not quite a full moon, but it's getting close. Turn to page eight, the very last page of your Moon Book. Use your pencil to outline where you see the bright part of the Moon, like this. Then shade in the part of the Moon that's dark.

ACTIVITY STEP 22

We took our last photo a few days later. That's four weeks after we started taking pictures. Here's what the Moon looked like. Discuss: Can you find a picture you've already drawn that looks like this?

ACTIVITY STEP 23

Our pictures show the full moon again, just like the one on page one of your book. When we started with the full moon, we noticed that the bright part of the Moon got smaller and smaller as the days went by. Now let's look at what happened after the Moon was completely dark. Start with page five. Look at the Moon's shape on page six, page seven, page eight, and page one. Discuss: What happened to the Moon's shape as the days went by?

ACTIVITY STEP 24

Here's what we noticed. The bright part of the Moon got bigger and bigger as the days went by. The Moon went from completely dark to a crescent to a half moon, and now it's full again. Discuss: What do you think will happen after this full moon? Here's a hint: Use your Moon Book to find out.

WRAP-UP VIDEO

In today's activity, you tracked the Moon for four weeks, and it only took you a few minutes. From the observations you made, you saw that the bright part of the Moon got a little smaller each day after the full moon, until eventually, we couldn't see any of it at all. After that, the bright part of the Moon got a little bigger each day, until it became a full moon again. That whole process took a little more than four weeks, and then the same change will happen again and again, over and over and over. It's a cycle. Remember how we made the different moon shapes with our arms before? Now, let's put them in order and try out the Moon's cycle. We'll start with the shape of the full moon, like this. A few days later, the Moon looks a little smaller. A few days later, it looks even smaller, a half moon. A few days after that, the Moon looks tiny, a crescent moon. Eventually, the Moon is completely dark. Next, the bright part of the Moon gets bigger again, but now it's facing the other way, a crescent moon. A few days later, it's another half-moon shape. The bright part seems to grow even more until it looks like this. Now it's your turn. What shape will the Moon look like next? The full moon. And what about a few days later? A little smaller. The cycle is starting all over again. You can put your arms down. What's great about cycles is that we can use them to predict the future. You can always figure out what the Moon is going to look like next because the Moon's shape always changes on the same cycle. In fact, the Moon's cycle is so dependable that some people and cultures even mark time using calendars based on the Moon. In Spanish and several other languages, the word for "moon" is "luna," so calendars based on the Moon are called "lunar calendars." You made your Moon Book today by looking at pictures of the Moon over time, but you can use your Moon Book by looking at the real Moon. If you want to take a nighttime nature walk under the full moon, you can use your Moon Book to figure out what night the Moon will be full. Next time you see the

Moon in the sky, notice what shape it is. If you look up at the night sky and you see a Moon that looks like this, you can count the days in your Moon Book until the Moon will be full again—a little more than two weeks. You can track the Moon as it changes, and even wow your friends by predicting exactly what the Moon will look like next Saturday, or on their birthday, or on your favorite holiday. You can be a Moon fortune-teller, whose secret is science. Have fun, and stay curious.