mystery science

Lesson: “Who set the first clock?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

So you get this present. You're so excited, ripping off the paper. You get it opened up. What's inside? A clock. This is the clock you've always dreamed of. Look at that beauty. What's the first thing you do? You want to set your clock, right? You run into the living room, look at the clock on the wall—and then it hits you. Wait, is that clock on the wall right? And you remember—oh, yeah, it's okay. My dad set the clock on the wall using his wristwatch. Well, wait, what did your dad use to set his wristwatch? So then you ask him and he says, “Oh, that's easy. I just looked at the clock tower downtown.” Now think about it for a minute. If every clock is set by looking at another clock, then how did the very first clock get set when there was no clock to look at? What was the very first clock? Think about that.

EXPLORATION VIDEO 2

In this lesson, we're going to consider how the very first clock was set. So first, let's take a step back and ask ourselves an important question: Why do we even use clocks at all? A day often works just fine for keeping track of time. Think of the things we say, like, "Bye, see you in three days!" Or in a conversation, "Oh yeah, I just saw him yesterday." If “day” were all we had for keeping track of time, that would actually be pretty lousy. See, when all we were doing was living in caves a long time ago, hunting for food all day, the concept of “day” was probably good

enough. We didn't need anything more detailed than that. But at some point, human beings started to live in civilizations and they started to form cities where lots of people live close to one another. And so people began to schedule things—you know, town meetings, celebrations, times to meet and trade things. Now, all of this continues on into today, and even more so than ever. Can you imagine? You go to the airport to greet someone and you don't know what time their flight comes in, or you have to just stay there all day? Modern civilized life requires that we be more detailed about time, and the concept of just “day” by itself isn't good enough anymore. So, at some point, someone realized we have to split the day into smaller parts.

EXPLORATION VIDEO 3

We could have split it into any number of smaller parts, just like if you have a pizza—you can cut a pizza into as many pieces as you want: eight pieces, 12 pieces, six pieces. You choose. It could be any number. The same thing is true for a day. You could divide it into any number of pieces. How about 24? We've been dividing the day up into 24 parts for thousands of years now. It was the ancient Egyptians and some other ancient civilizations who decided on the number 24. Why 24? Is there something special about that number? The short answer is, not really. Just like cutting up a pizza, it could have been any number of pieces, but there is some reason that the ancient civilizations chose 24. I'll tell you. First of all, it wasn't actually 24 that was important to them, but the number 12. You see, the ancient Egyptians divided the day into two parts—daytime and nighttime—and they divided each half into 12 parts. So they had 12 parts of daytime and 12 parts of nighttime. 12 + 12 = 24. That's where you get the idea of 24 hours in a day. But why 12? What's so special about that number? Why do they choose to divide each half into 12 parts? Well, when we are counting things, we often count using our fingers. Because we have 10 fingers, we've given a special importance to the number 10. We

like to count years by tens. We call them decades. You ever hear people talk about the 70s or the 80s or the 90s? We like to make top 10 lists. In fact, our whole number system is based on the number 10. Notice how we have 10 different symbols that we use for numbers? But this is just a custom we have. Just because you have 10 fingers doesn't mean it's the only way to count things. Different people have used different customs. For example, the ancient Egyptians, whenever they'd count, they'd use their thumb to count their finger segments rather than count each finger itself. Go ahead and count your finger segments using your thumb. How many finger segments do you have?

EXPLORATION VIDEO 4

From now on, you can think of the Sun as like a giant hour hand moving across an invisible clock in the sky. When the Sun is directly overhead, this is noon. Then it gets to 1:00 PM, 2:00 PM, 3:00 PM, until sunset at 6:00 PM. But look at this photo taken sometime in the afternoon. School's going to let out. Is the Sun at 2 o'clock here, 3 o'clock, 4 o'clock? Without those imaginary numbers painted up there, it's hard to tell just by looking at the sky, not to mention you shouldn't actually look at the Sun — it's dangerous. If only there were some way to easily measure the sun's position. Well, there is. Here's a hint: watch this video that's been sped-up and notice what happens. Do you see what's going on with the shadows? OK, stop and discuss.

EXPLORATION VIDEO 5

So, we see that shadows move across the ground during the day as the Sun moves across the sky. We can’t write numbers of each hour in the sky to keep track of time, but using the shadows, we could write numbers of each hour on the ground, right? So when the shadow's here, we could make a mark. And then as that shadow moves, we could make more marks on

the ground. This is how the very first clocks were made; we just kept track of the sun's shadow on the ground. This type of clock is called a *sundial*. Now, obviously, clocks today are a bit more complicated in how they work. But they're telling you the exact same thing. The hour hand on a clock is telling you the Sun's position in the sky, just like a shadow on the ground.

ACTIVITY INTRODUCTION VIDEO

In this activity, you're going to make a shadow clock, or sundial, that will let you use the Sun to tell time. Here's how it works. A shadow cast by sunlight points to the numbers around the clock, which tells you the time. Like, notice this shadow is in between the 4 and the 5, and it's on the PM side. So, this shadow clock is telling you that when this photo was taken, it was about 4:45 PM. Isn't that cool? After you make your shadow clock, you'll experiment with it inside the classroom. You'll use a flashlight instead of the real Sun so that you can see how the shadow clock works. Are you ready? Here are step by step instructions for how to make your own shadow clock.

ACTIVITY STEP 1

Get your starting supplies. You'll get more supplies later. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Write your name and date on the back.

ACTIVITY STEP 3

Using a ruler, make a giant plus sign or cross, like this.

ACTIVITY STEP 4

Label the points of the cross like this. To remember where to put the letters, you can say, “Never Eat Soggy Waffles.” You just have to go in a clockwise direction, like this: “Never, Eat, Soggy, Waffles.” North, East, South, West.

ACTIVITY STEP 5

Cut out the clock template. Then glue it to the plate. Make sure when you do this that the point faces North and that the lines on the template match up with the North-South line that you drew.

ACTIVITY STEP 6

Find the current month and put the sticky tack there. Then put in the toothpick so that it's sticking straight up. You don't want it to be tilted to the side, so check that it's straight. Now your clock is done.

ACTIVITY STEP 7

Find a partner to work with. Your teacher will pass out flashlights and turn off the lights. You and your partner only need one shadow clock. You can set the other one aside. You're done building — now you're going to do some experimenting.

ACTIVITY STEP 8

Experiment: move the flashlight and watch the toothpick's shadow. Can you make a shadow long enough to reach the numbers on the clock? Work together to figure it out.

ACTIVITY STEP 9

Move the flashlight so the shadow points to the morning hours, AM. Then discuss these questions as a class.

ACTIVITY STEP 10

Now, move the flashlight so the shadow points to the evening hours, PM. And then discuss these questions as a class.

ACTIVITY STEP 11

Can you make the clock go from 6:00 AM to 6:00 PM? Try it out, and then discuss as a class.

ACTIVITY STEP 12

On your classroom walls, there should be a sign that says "North." Rotate your shadow clock so that the N faces in that direction. It's going to be important to keep your clock lined up like this for the next few steps.

ACTIVITY STEP 13

What time is it? Move your flashlight until your shadow clock matches the real time. Remember to keep your shadow clock facing North.

ACTIVITY STEP 14

Discuss this question as a class.

ACTIVITY STEP 15

Sometime this week when the weather is sunny, you'll take your shadow clock outside and test it with the real Sun. Just line up the North-South line on your clock to where North and South are in real life. The shadow will tell you the time. Good luck!