Lesson: “Can you outrun a dinosaur?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

I want you to imagine that a dinosaur comes charging after you. Now, even if you love dinosaurs, you probably don't want an animal this big to get too close. If the dinosaur is a plant eater, it could step on you by mistake. And if the dinosaur's a meat eater, as I think this one might have been, it might gobble you up as a snack. So, like any sensible kid, you're going to run away. But can you run fast enough? Can you outrun a dinosaur? Now, what are you going to need to know in order to answer this question? Well, you're definitely going to need to know how fast dinosaurs could run. To know how fast dinosaurs ran, you can't use a video like this because this dinosaur is totally fake. It's a person inside of a dinosaur costume. Most of what we know about dinosaurs comes from fossil dinosaur bones. And their bones, of course, won't tell us how fast they ran. But bones are not the only fossils dinosaurs left behind. For every dinosaur bone that people have found, they have found thousands and thousands of these. Can you tell what they are? They're fossil dinosaur footprints. Millions of years ago, dinosaurs walked in the mud, leaving footprints like this behind. The mud dried and eventually hardened into stone. The marks the dinosaurs left in the mud became fossil dinosaur footprints. These fossil dinosaur footprints have turned up in many places around the world, like here in Texas, where scientists dug down and discovered them along the bottom of an old stream. In some places, scientists found fossil dinosaur bones near the footprints. So we know that it was

dinosaurs that left these tracks behind. They also discovered that the bones of those fossil dinosaur feet fit the fossil footprints perfectly. So dinosaurs left behind footprints. It's so cool that these exist. But what do they tell us about dinosaurs? I mean, could a fossil footprint ever help us solve mysteries, like how fast did dinosaurs run? Well, fossil footprints can definitely tell us how big some dinosaurs were. But we already knew how big some dinosaurs were just from looking at their fossil bones. So, is there anything else the footprints could tell us? Remember when we wondered what dinosaur teeth could tell us about dinosaurs? What did we do? We looked at the teeth of animals alive today, and we realized we can figure out what an animal eats by looking at its teeth. So what if we look at the footprints of animals alive today? Can they show us something interesting? When you want to figure out something about the past, it's often useful to look around at the present. For example, check out these two sets of tracks. Neither of these were dinosaurs. They're both of animals that are alive today. What can you figure out about these animals just by looking at their footprints?

EXPLORATION VIDEO 2

So you see, just from footprints alone, you can tell something about the animal. For example, we just saw how you can tell if an animal walked on four feet, like a squirrel, or if it walked on two feet, like a bird. When scientists find dinosaur footprints, they can tell this too. Sauropod dinosaurs walked on all four legs. Tyrannosaurus rex walked on two legs like a bird does. And that makes sense because otherwise, a T-Rex would have looked really crazy walking around on all fours with these two tiny little arms. Now what we really want to know is how fast that dinosaur was going. Is there any way we can tell that? Obviously, this would be much easier if dinosaurs were still alive. We don't have a dinosaur here at Mystery Science Labs. But we do have plenty of people who can walk on two feet, just like this dinosaur did. So let's again use the

present day to help us figure out the past. Let's experiment with people tracks to see if that could tell us about how fast someone was moving. What's an easy way to make tracks? Well, if your feet are wet, you leave tracks on the pavement. So we had our friend Pat walk with wet shoes on the sidewalk. And as she did that, we took this video of her footprints. So, here were her footprints as she walked. And I've outlined them in yellow so you can see them better. Now, try and picture in your mind, how will these footprints be different if Pat were to run instead of walk? Let's see now, you ready? Interesting. So I've outlined those in green. Those are her footprints as she was running. So, if you were walking, you leave footprints like this. But if you're running, you leave footprints like this, spaced more apart. Now think about that. As you move more quickly, your steps get farther apart. And so you can see that when you look at footprints. Now, you might object: OK, that works for people. But does this still hold true for animals? But check out this video of an ostrich. Watch what happens when it starts to run. When it was walking, its steps were small. But when it's running, it takes big steps. So suppose that you found the tracks of two ostriches side by side. Their footprints are the same size, so you figure the ostriches are about the same size as each other. Ostrich number one is taking big steps. And ostrich number two is taking little steps. Which ostrich do you think was moving faster?

EXPLORATION VIDEO 3

Here's an idea we had. Scientists have found lots of fossilized dinosaur footprints out in the world, just like this. What if you could recreate these footprints on a floor, then compare them to your footprints? You could look to see who took the biggest steps. That would tell you who won the race: you or a dinosaur. There's only one problem with this idea. Which dinosaur should you race against? It wouldn't be fair to have you try racing against a Tyrannosaurus rex. Even a T-Rex just walking is going to outrun you. Each step of a T-Rex is so huge. But we can solve

this. To make things a little more fair, why not try racing some smaller dinosaurs? Not all dinosaurs were huge like T-Rex. Here are four different kinds of dinosaurs that were closer to your size. We can tell how long their legs were by looking at their fossil leg bones. To have a fair race, you just wanna figure out which of these four dinosaurs had legs that were closest in size to your legs. We've actually created some printouts and step by step instructions that can help you do this. Check out the next video to get started.

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're gonna see if you can outrun a dinosaur. You and a partner will work together to measure the distance between your footprints when you run. Then you'll lay out the footprints of some small dinosaurs, and compare them with yours to see if you're able to outrun them. You'll probably wanna do all of your racing in a hallway or gym. Before you get started on that though, first, you and a partner will measure each other's leg lengths in order to decide which of these four dinosaurs is best for you to race against. We'll show you how to get started, step by step.

ACTIVITY STEP 1

Find a partner. You'll work together to see if either of you can outrun a dinosaur. Decide who will be the Runner first and who will be the Marker first. But don't worry, you'll change jobs later so you both get to run. If you're working alone, you may wanna get a helper. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Get these supplies.

ACTIVITY STEP 3

Okay, go ahead and write your name on your worksheet. Then write your partner's name on the sticky note and stick it to your worksheet. In just a little bit, you'll be using this sticky note to mark where your partner finishes their race.

ACTIVITY STEP 4

First, let's figure out which dinosaur has the same leg length as you. Runner, you'll wanna sit on the floor like this. Straighten out your leg so your partner can measure from your hip to the bottom of your foot. Marker, first you'll see how many rulers fit between your partner's hip and their foot. Start with the end of the ruler at their hip, like this. Use your finger to mark the end of the ruler. Then count out loud. That's one ruler. Lay the ruler down again like this. That's two rulers. Then, lay it down again. That's three rulers. Then, measure how many more inches it takes to get to the bottom of the foot. Write down how many rulers you measured and leftover inches or centimeters. When you're all done, be sure to switch roles with your partner so that you both get your legs measured.

ACTIVITY STEP 5

To figure out your leg length, you'll wanna do the math shown on your worksheet. Here's what you do. Multiply the number of rulers by the length of the ruler. Then add the extra bit you measured at the end. Have your partner check your answer when you're done.

ACTIVITY STEP 6

It's time to find out which dinosaurs you'll be racing against. Circle the dinosaur that has your leg length, or a little shorter. That's the dinosaur you'll be racing. Our leg length was 37 inches, so we're racing against CeeLo, but yours might be different. Remember the different dinosaurs you'll be racing against: there's VeeLo, SanJuan, DeeNo, and CeeLo.

ACTIVITY STEP 7

In a few minutes, you're gonna leave the classroom to run. So I'll tell you what you're going to do, but don't do anything yet. You'll have a turn running and a turn marking how far your partner ran. Here's how it works: Runner, you'll start at the starting line. Marker, you'll take the worksheets, and move to the end of the racetrack, to about where you think the runner will end up. Go to the next step and I'll show you what to do next.

ACTIVITY STEP 8

Keep listening so you'll know what to do. Runner, when your teacher says go, you'll run as fast as you can for eight steps, like this. Count each step out loud as you run. Marker, you'll put the sticky note where step number eight lands. Pay close attention to where the Runner's foot lands. They may run an extra step. Afterward, trade jobs so both people have a turn to run. Go to the next step, and I'll explain the last thing to do.

ACTIVITY STEP 9

After everyone runs, you'll need to measure out eight dinosaur steps for each dinosaur. You'll use fossil footprints on a string like this. That's the length of your dinosaur's step. Two people

will pretend they're a dinosaur and take eight steps, like this. One step, two steps, three steps, and so on. When you get to step number eight, mark that step with the dinosaur sticky note, like this. Do this for all four dinosaurs. Then you'll look at your dinosaur sticky note and see who ran farther, you or the dinosaur you were racing. Okay, go to the next step.

ACTIVITY STEP 10

Now it's time to race. Go ahead and take your worksheet and your sticky note. Go to where you'll run. If you forget what to do, you can look at the picture on your worksheet. When you're done, come back to the classroom and watch the next slide.

ACTIVITY STEP 11

Using what scientists have learned from fossils, you figured out if you could outrun a dinosaur. Now, suppose that some scientists in the future found fossil footprints that you left behind on a muddy path. Discuss.