Lesson: “What’s strong enough to make a canyon?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! I'm not sure what it's like where you live, but where I grew up, the land was very flat. There are no mountains. There are not even any hills. It's all flat cornfields as far as your eyes can see. So whenever I saw a picture of someplace that had mountains, I'd always think, wow, those look amazing. I'd love to see those close up. When I was six years old, I got my first chance. My mom and dad were able to get time away from work and took my family on a car trip through the Western United States. I was so excited. We drove through states like Colorado, Utah, and Arizona, and on that car trip, for the first time ever, I did get to see mountains. And they were amazing! I got to see huge mountains. I got to see small mountains. I got to see hills. Whatever I saw, the land was always bumpy. It was hardly flat anywhere in the Western United States. But while we were visiting these states, I was surprised to find out about a totally new kind of landform that I'd never seen. You see, mountains are places where the land goes up, but on our trip through the mountains, we saw places where the land goes down. And it's just as amazing to see. A place where the land goes down like that is called a canyon. You might have heard that word before. Here's a picture of a real canyon. In fact, this is the most famous canyon in the world. Do you know what it is? It's the Grand Canyon in Arizona. It's like a huge crack in the earth. Here's another picture of it. It's really wide, and it's nearly a mile deep. Now there are

a lot of other canyons. They don't always have to be so big, and some of my favorite examples are these smaller canyons found in Arizona and Utah. There are even ladders so that you can climb down and go into these small canyons. Let's see what it's like inside of one. Here are some people walking through the bottom of that canyon. I said canyons are like a big crack in the ground. Why do you think there are these cracks in the ground like this? What makes a canyon?

EXPLORATION VIDEO 2

So why do you think there are cracks in the ground like this? What makes a canyon? You might have had a few different ideas. One thing you might have thought of is that there could have been an earthquake a long time ago, which made a crack in the ground, and it's just been there ever since. But when there's an earthquake, it does something more like this. Earthquakes can lift the ground up, or even cause the ground to go down a little. But earthquakes don't always make cracks in the ground. Sometimes they do. But here's the thing about those kinds of cracks. They're actually just a thin rip in the ground. They're never deep cracks, the kind you could fall into or walk around in. An earthquake crack also tends to be in a straight line like this. But if you look at canyons, they are not anything like that. They're usually deep. Deep enough, you could walk around in them. And they're not always straight lines either. Canyons are cracks that can curve around, like the shape of a river. That's actually a clue to why there are canyons. If you're around a canyon during or after a rainstorm, you have to be very careful. Because canyons are cracks in the ground, water might start to pool up at the bottom of the canyon, like this. And if that water got too deep, that wouldn't be good. Look at this. This is after a rainstorm and you could see water doesn't just sit at the bottom of the canyon. It's actually flowing out of the canyon. Could that be a clue about how canyons form? Look at the color of the water. Do

you see that? That water is so muddy and brown. The water is the same color as the canyon walls. It's all full of sand, and mud, and even rocks. It's like the water is carrying stuff out of the canyon. Could it be that water is what makes a canyon? If that's true, it would mean something kind of unbelievable. It would mean water is acting like an excavator, carving sand, and mud, and rocks out of the ground. Is water really that powerful that it could cut into the earth like an excavator? Well, could you think of an experiment that would let you figure out whether water could really make a canyon?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to create a model of a place where the land goes up—a spot that's higher than all the land around it. Then, you'll pour water on that land to act like rain and see what happens as it rains again and again. Now, when I say you're going to make a model, I mean you're going to make a small version of something. Like here's an actual big piece of land. This is a flat hill called a plateau. You could try to experiment with this big piece of land by pouring water on it. But that would take a lot of water. By making a smaller version of this, though, now it's easy to experiment with it. So we can learn what happens. Scientists often create models in order to figure out how things work. What do you think will happen when you drip water on your land? For this activity, you need to be a really good observer. You're going to drip four small cups of water on the land and watch carefully for any changes. All right, are you ready to see if water can change the land? I'll show you how to set things up, step by step.

ACTIVITY STEP 1

If you're in a class, find a partner. You'll share supplies with others at your table. If you're at home, you can work alone. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Cover your table with a tablecloth or newspaper to protect it from spilled water.

ACTIVITY STEP 3

Get your supplies. You'll get more later. If you're working in a classroom, you'll share some supplies with your partner, and other supplies with your whole table.

ACTIVITY STEP 4

Put your paper plate on your plastic plate. You'll build your land on top of both.

ACTIVITY STEP 5

Fill one dixie cup halfway with your land. Then use another dixie cup to squeeze it down like this. The better you squeeze it, the better it will keep its shape when you dump it out. Both you and your partner do this. You can make them at the same time.

ACTIVITY STEP 6

Turn each cup over near the edge of the plate. Tap on the bottom and lift the cup up. Do it to both cups. And now, you have two little hills. If you don't like your first try, you can dump it back

in the bowl and try again. But don't worry about making a perfect hill. Real hills have plenty of cracks and lumps and bumps.

ACTIVITY STEP 7

Keep making hills until you have four total. Then carefully push all of them near the edge of the plate, like that.

ACTIVITY STEP 8

Have one person hold the plastic plate still and push the paper plate up, like this. Have the other person clip the plates together. This will make it so that your water doesn't spill off the plate when you add water. And it'll also give a nice slope, so that the water can flow from high to low, just like on real land. It should look like this when you're done.

ACTIVITY STEP 9

Put one spoonful of land into the spaces between the hills. No more than one spoonful. Then smooth it with a spoon. When you're done, you'll have one big clump of land.

ACTIVITY STEP 10

Get two plastic cups, a drip stick, and two sets of handouts—one set per person.

ACTIVITY STEP 11

Turn over the big cups and put the drip stick on them, like this. Then push the land under the arrow on the drip cup so that when you add water, the water will fall on your land.

ACTIVITY STEP 12

Remember, what you just made is a model of real land. Talk with your partner about what you think will happen when you drip water on it. Will the water make a lake, a river, a waterfall, something else?

ACTIVITY STEP 13

Time to try the experiment! Fill the drip cup and watch to see what the water does. This is a chance to practice your observation skills. Look for small changes in the land. If not all the water drips out of the cup, that's okay. Go to the next step when everyone's water stops dripping.

ACTIVITY STEP 14

Draw what the water did to your land in the first box on your handout.

ACTIVITY STEP 15

Let's see what more water does. Fill the cup again, and watch what the water does to your land. Then, draw what happened in the second box on your handout.

ACTIVITY STEP 16

Time for another cup of water. Fill the cup again and watch what the water does to your land. And then draw what happened in the third box, which is on the second page of your handout.

ACTIVITY STEP 17

Time for one last cup of water. Fill the cup and watch what the water does to your land. Draw what happened in the last box on your handout.

ACTIVITY STEP 18

If you're in a class, turn to the others working at your table, tell them what the water did to your land. Listen as they tell you what the water did to their land.

ACTIVITY STEP 19

Do the last question on your handout.

ACTIVITY STEP 20

If you're working in a class, look at other students' land. Discuss. Do you see anything that looks like these pictures?

ACTIVITY STEP 21

Clean up! Scrape the land back into the bowl to use in other experiments. Throw the paper plates away, wash the plastic ones so you can use them again, then, watch the last video.

WRAP-UP VIDEO

So you did an experiment to find out what happens to land when it rains over and over. This is a sped-up video showing what I got when I tried this experiment. Just like you did, I poured the

water over and over. And as you can see, when I did this, I actually saw a little canyon form. Maybe you got a canyon too. But you might have gotten to see something different. Like, watch this. Notice how this time when I did it, all the land kind of spilled out. Well, this happens in real life after heavy rains as you can see here in these mountains. Or maybe when you did this experiment, you got something like this. Do you notice how the edges of the land start to crumble, and fall, and left behind a cliff? Well, that's also something that happens sometimes after heavy rains as you can see here. Water really is as powerful as an excavator. Water is what digs out canyons. It even dug out the Grand Canyon. In fact, the Grand Canyon, along with a lot of other canyons, has a river at the bottom of it, which keeps carrying dirt and rocks away. As time passes, water will make the Grand Canyon even deeper and wider than it is now. In all of these examples, you can see how the water can pick up sand, and dirt, and rocks, and carry them. That means the land moves from one place to another. The power of water to move land, that's what in science we call erosion. Erosion is so powerful that it can change the shape of the land around us, creating new landforms, like canyons. Or these things you might have seen. We call them fans. And these things, we call these landslides. You don't even have to live near a canyon to find your own example of erosion. Check this out. My friend Pat spotted these canyons forming near her house. Now without anything to compare it to, you might think these are pretty big canyons. But look now as we zoom out. You can see the person next to it. And now, you see these are just tiny canyons, about the size of a person. You'll be surprised what you find if you look around, especially after it rains. Look for gutters, or look at ditches on the sides of roads or even any streams or creeks that you have nearby you. You can find small versions of canyons. And if it's not raining, that's no problem. Use a bucket of water or a hose and spray it on some dirt or sand. See what tiny versions of canyons and other erosion landforms that you can find near you. Have fun and stay curious!