Lesson: “Why don't trees blow down in the wind?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! I want to tell you a little story. One summer, my family went on a day trip to the beach. I was so excited. We packed our stuff and got to the beach early in the morning. There were no clouds and the sun was shining brightly. Soon, it started to get hot, really hot. I wasn't used to being so hot. I decided I wanted to take a rest in the shade. But I looked around, and there wasn't any shade at the beach. Now back at home, there were plenty of trees in our neighborhood that made lots of shade. So I could always cool down in the shade if I got hot. But at the beach, there weren't any trees at all. How could I get in the shade with no trees? Ahhh—I knew I could create my own shade with an umbrella. My dad had one in the car. So I set up our umbrella by sticking it in the sand and opening the top wide. It created a big shady spot. But now I noticed there was a problem. It was getting pretty windy at the beach. Sure enough, a gust of wind blew my umbrella away. I ran after the umbrella and put it back in the sand. Ah—shade. But then another gust of wind blew it away, and I realized that wind and umbrellas don't go very well together. One day there was a lot of wind at a beach and someone got a video of it, and this is pretty funny—check this out. Wow—the wind must be really strong. Look at all those umbrellas going. I bet it took a long time to find all the umbrellas that blew away and bring them all back. But now notice something here—not everything is blowing away, is it—like this—this beach chair and this garbage can. And even this umbrella that wasn't open, it's lying

on the ground. Watch—they don't blow away. Why do you think that the open umbrellas blow away but the other things on the beach don't?

EXPLORATION VIDEO 2

My umbrella was great for creating shade, a nice cool spot that I could lay down in, but on a windy day, it might blow away. I thought again about the shady trees at home. Hmm, many trees are shaped kind of like umbrellas. They have skinny trunks on the bottom, just like an umbrella has a skinny pole. Trees also have lots of leaves spreading out on top, just like an umbrella has fabric spreading out on top. Both give lots of shade, but on a windy day, trees don't fall over like an umbrella does. Sure trees can fall over, but that's pretty rare. A breeze that knocks down an umbrella isn't going to knock a tree over. Why is that? Why do you think trees don't get blown down by the wind?

ACTIVITY PART 1 STEP 1

Stand up and find a spot where you have space to move. When you're done with this step, click the arrow on the right.

ACTIVITY PART 1 STEP 2

Stand tall, as tall as you can. Your body is the tree's trunk. Then spread your legs like the roots of a tree. Great job! Go to the next slide.

ACTIVITY PART 1 STEP 3

Put your arms up. Your arms are branches. Your hands and fingers are leaves. There's no wind yet, so don't move. Okay, go to the next slide. Slide.

ACTIVITY PART 1 STEP 4

Now, it's time to be a tree in the wind. Here comes the wind. Bend your branches and trunk. Wave your leaves in the wind. Now the wind blows you this way. Oh, now the wind blows you the other way again. Great job! Now we're done being trees. Everyone can take a seat.

ACTIVITY PART 1 STEP 5

Discuss.

ACTIVITY PART 1 STEP 6

There's one more thing we can do to help us figure out why trees don't blow down in the wind, but umbrellas do. We can compare trees with umbrellas. I mean, we can look at them side by side. So let's compare their different parts. An umbrella's poll is stiff and straight. What do you notice about trees that's different?

ACTIVITY PART 1 STEP 7

Look up at an umbrella and look up at a tree. What do you notice is different?

ACTIVITY PART 1 STEP 8

Look at the bottom of a beach umbrella and look at the bottom of a tree. What do you notice is different?

EXPLORATION VIDEO 3

Trees have some interesting parts that keep them from blowing over in the wind. Why don't trees blow over in the wind? Well, you might have noticed their roots. Like if we could remove all the dirt from around a tree and see the view of its roots looking sideways, it would look like this. The roots are one of a tree's parts or structures. The roots of a tree go deep in the soil and they spread out. They help hold the tree in place. Those umbrellas we saw earlier, they don't have anything like roots. In fact, there was nothing to hold these beach umbrellas down. They were just stuck into the sand. What other parts of a tree help keep it from blowing down in the wind? Well, here's one other thing to notice. Look at the way the tree's leaves move when the wind blows. Trees leaves can wave around one by one in the wind, rather than catching all the wind at once the way an umbrella does. If trees had one giant leaf instead maybe they would blow down in the wind. Okay. So there are the roots, which help trees not fall down in the wind and there's the way the leaves can all wave around one by one. What other parts of a tree might help it from blowing down in the wind? Well, here's one last thing that I noticed. Look at the tree's trunk and branches when the wind is blowing. Do you notice this? The branches bend but they don't break. When the wind blows on an umbrella's pole, the pole doesn't bend at all. It's stiff and straight. So that's one more part that trees have that helps them to not blow down, bendy trunks and bendy branches. Roots, leaves, and branches are structures that keep trees from being blown down. It's like these structures give trees a superpower—the ability to stay up even when the wind blows strongly. This also makes them super at making shade for people when it's windy outside. So could we design an umbrella to be more like a tree so that it doesn't blow down in the wind? What ideas did trees give you?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to be an inventor, and you're going to invent an umbrella that won't blow away on a windy day at the beach. Rather than making a full-sized umbrella, you're going to experiment with a small umbrella that you make out of paper. Now because you're using paper, it's easy to try a lot of experiments. And that's good because any inventor can tell you, you need to try a lot of different things to make something that works just the way you want it to. To make an umbrella that doesn't blow away, you're going to borrow ideas from a tree, you're going to look at the leaves, the branches, and the trunk, and see what ideas they give you. The only thing you won't be able to experiment with is the roots. Instead of having roots, your umbrella will have an umbrella stand. All the umbrellas you make will be tested like this. Here are some umbrellas, and here's a fan to make wind. What do you think will happen when the wind hits these umbrellas? After you see what the wind does to your umbrella, you'll have a chance to change your umbrella or build a new one. I'll show you how to get started, step by step.

ACTIVITY PART 2 STEP 1

Make sure you have a test station ready for this activity. That means a tabletop and a Big Wind fan. When you're done with this step, click the arrow on the right.

ACTIVITY PART 2 STEP 2

Get your supplies.

ACTIVITY PART 2 STEP 3

Write your name on your umbrella pattern. Then, cut out the circle on the solid line.

ACTIVITY PART 2 STEP 4

Cut on the dotted line until you reach the stop sign. Stop. Okay. It'll look like this when you're done.

ACTIVITY PART 2 STEP 5

Wrap the pipe cleaner around your finger to make a loop like this. Make sure the part above the loop is about as long as your finger.

ACTIVITY PART 2 STEP 6

Hold the pipe cleaner like this and twist the loop twice to make sure it stays put. It'll look like this when you're done.

ACTIVITY PART 2 STEP 7

Find a partner to help with the next step. It's a tricky one.

ACTIVITY PART 2 STEP 8

Hold the paper like this, and have your partner slide the pipe cleaner in until the loop hits the stop sign. Then, cover the gray triangle by moving A to cover B. Have your partner use stickers to hold it in place, like this. One more sticker here on the backside. Last, you're going to bend

down the pipe cleaner like this. Now, it's okay if your umbrella doesn't stand up straight yet. We'll deal with that in the next step.

ACTIVITY PART 2 STEP 9

Grab the bendy end of your straw and slide the straw over your pipe cleaner, like you see here.

ACTIVITY PART 2 STEP 10

Get your cup of Play-Doh and push the end of the straw into it, like this.

ACTIVITY PART 2 STEP 11

Now everyone has an umbrella just like the ones you saw at the beach. Will they fall down in the wind? It's time to find out. Pick a few umbrellas to put on the test table and then go to the next step.

ACTIVITY PART 2 STEP 12

Let's see if your umbrellas stay up in the wind. If you're in a group, your teacher will be the Big Wind. If you're working alone, you have to be your own wind. Big Wind: stand a few steps away from the test table and gently wave the fan back and forth, like this. Do your umbrellas stay up in the wind? Ours didn't.

ACTIVITY PART 2 STEP 13a

Now it's time to invent a new umbrella. Discuss.

ACTIVITY PART 2 STEP 13b

Here's something we thought about.

ACTIVITY PART 2 STEP 14a

Discuss.

ACTIVITY PART 2 STEP 14b

Here's something else we thought about.

ACTIVITY PART 2 STEP 15

Now it's time to start inventing. You can either make a whole new umbrella or just change the one you already have. Decide if you're going to change your umbrella or make a new one. Get any supplies you need.

ACTIVITY PART 2 STEP 16

Change your umbrella or make a new one. Watch the screen if you need to remember the steps of how to put the top and pull together.

ACTIVITY PART 2 STEP 17

Test your new umbrella. Does it take more wind to knock it down? Remember, stand a few feet away from the test table, and gently wave the fan back and forth, like you see Pat doing.

ACTIVITY PART 2 STEP 18

Discuss then advance the slide to watch the final video.

WRAP-UP VIDEO

So we had a problem. We wanted a shade structure that wouldn't blow over, and we tried to design a solution to that problem. We tried changing the top of the umbrella to make it more like the top of a tree. We cut it up so that it was like the leaves of a palm tree. Those are leaves that could flap in the wind. We also tried cutting holes in it, so the wind could blow through. And we tried changing the handle of the umbrella so that it was bendy like the trunk and branches of a tree. We even tried both of these changes together, a bendy handle and leaves, so that the wind could blow through. Now, our old umbrella fell down right away, but our new umbrellas, check this out, based on trees, they bent, and they fluttered in the breeze. They didn't fall over. It took a lot of wind before they got knocked down. So when you're trying to solve a problem, there are lots of ways to look for solutions. There's not always just one way. One thing you can do to help find solutions is to look at plants and animals that have solved the same problem. In this case, we looked at how trees solve the problem of not falling over when the wind blows. We looked especially at tree trunks, branches, and leaves to give us ideas. Are there other problems that living things might help us solve? Like maybe an acorn cap could help you make a better bicycle helmet. Or maybe when you look closely at the seed of a dandelion flying away in the wind, that might help you create a new kind of parachute. Or a lizard might give you an idea for how to blend in or hide something. Next time you're outside, take a look at how plants and animals solve their problems, and how they might help you solve yours. The living world is full of problem-solving plants and animals. Have fun and stay curious!