mystery science

Lesson: “How can you keep a house from blowing away in a windstorm?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! Have you ever experienced a really windy day, the kind of day like you see here, when the wind blows away your hat or your umbrella? Sometimes the wind can even make it difficult to walk. Look at this person leaning far forward into the wind so that he doesn't fall over. But you know what? The wind can get even stronger than this—so strong that you definitely don't want to be outside. Here's an example: it's a tornado. Tornadoes form this funnel shape reaching down from the clouds. That funnel is made of wind moving very fast, and when a tornado reaches the ground, it can cause really bad damage. Tornadoes happen in places all over the world, but the place with the most tornadoes is here in the central part of the United States. This area is actually called Tornado Alley because of how many tornadoes that happen here. But if you live near the coast, you might have experienced a different type of strong wind: a hurricane. This is a sped-up view of a hurricane from space. Hurricanes swirl just like a tornado, but they're much bigger, and they don't have a funnel shape. A hurricane is a giant storm that forms over the ocean and then sometimes moves onto land. Like tornadoes, hurricanes happen all over the world, but only in certain places. In the case of hurricanes, it's always near an ocean. You might know that hurricanes can cause more problems than just wind, like flooding. But when they first come to shore, it's the wind that's the problem. And what

about other places? If you live near a desert, you probably don't get hurricanes or tornadoes, but you might have another type of strong wind: a dust storm. Dust storms happen more regularly in dry areas. When strong winds pick up lots of dust and sand, they can make it really hard to see. They can even make it hard to breathe. All of these things—dust storms, hurricanes, and tornadoes—are kinds of natural hazards that are caused by strong winds. People get worried if one of these natural hazards is going to happen where they live. What about you? Do you have strong winds where you live? Have you ever experienced one of these natural hazards?

EXPLORATION VIDEO 2

Strong winds cause lots of problems. They blow down all kinds of things, things like traffic lights and street signs, things like sheds—whoa. Look at this: even the rooftops of buildings can get blown off. Entire trees might get knocked over sometimes onto roads, which can block traffic. Even worse, if trees fall onto power lines, they can cause the electricity to go out in your neighborhood. Here's another example of what can happen during strong winds. This is a video taken during a tornado in Texas. Now, it's pretty hard to see what's going on because we're actually looking into a tornado, so let me play the video again. Look closely, right there. You see those? Those are semi-trucks—18 wheelers. I'll play it one more time. Watch again. These huge trucks are getting picked up and tossed around by a tornado. Luckily, no one was inside those trucks. Many people leave before a windstorm comes. They might still be worried about what will happen to their homes during windstorms—windows might get broken by strong winds, roofs can get torn off, even whole houses can get blown away—but people have come up with solutions for how to keep homes safe during strong winds. These people, called *engineers*, create new materials and new ways of building things. Engineers identify a problem they want to

solve, like strong winds blowing things away, and then they brainstorm solutions. They try lots of different ideas. They don't just get it right on the first try. Often, their ideas don't work at first. They keep changing their ideas until they find a solution that does work. If you were an engineer, how would you help solve the problem of keeping houses safe during strong winds? How could you protect your house during a windstorm?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to design a home that won't blow away in a windstorm. Imagine that you've saved up a lot of money to build your dream house. You hire a construction company, the La-Z Builders, to build it. They build most of the house, but then they decide they don't feel like finishing and they just leave. You go to check out your dream home, and you realize you've got some big problems. The walls of your house are built, but they aren't even attached to the ground, and the roof it's just lying there on the ground not attached to the house. Even worse, you hear there's going to be a big windstorm soon and you can't find any other builders to help out in time. You're going to have to finish this job yourself. Luckily, the people who design buildings, called construction engineers, they don't just start building things right away. When they want to solve a problem, they start with a small model of what they're going to build before they build the real thing. You're going to do what a construction engineer would do: you're going to build a model of a house made out of paper. Then, you'll use your model to figure out a way to attach your roof to your house to keep it from blowing off. And you'll also need to design a way to keep your whole house from blowing away in the wind. OK, first, I'll help you build a paper model of a house. You'll get to test out two different designs. I'll show you how to get started step by step.

ACTIVITY STEP 1

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

ACTIVITY STEP 2

Get your house worksheet. Cut on the center dashed line first to separate the two halves of the house. Then cut all the other dashed lines. Be careful. Don't cut through the solid lines, just the dashed ones.

ACTIVITY STEP 3

You'll start by making the roof for your house. Find the piece that looks like this. Carefully fold each of the solid lines. Crease each fold with your fingernail. The pattern of the roof should be on the outside, like this.

ACTIVITY STEP 4

Turn the paper over so the white side is up and put each A flap flat against the roof, like this. Hold it in place with a sticker. Then do the same to the other side. Now, the roof of your house is done.

ACTIVITY STEP 5

Now you're going to make the base of your house. You're going to do this just like you did with the roof. Find the piece that looks like this. Carefully fold each of the solid lines and be sure to

crease each fold with your fingernail so that the folds lay flat. The doors and windows should be on the outside. When it looks like this, you're ready to go to the next step.

ACTIVITY STEP 6

Start with one end of the house. Overlap the two B flaps like this. And fold the C flap over them. Then do the same thing on the other side. It should look like this when you're done.

ACTIVITY STEP 7

Find your "Wind Maker" worksheet. Fold the sheet in half like this along the thick solid line. Then fold the 1 on top of the 1. Flip the paper over and fold the 2 on top of the 2, and keep going like that. It should all look like this when you're done.

ACTIVITY STEP 8

Put a paperclip across the end of the folded paper where it says “paperclip,” like this. Then carefully spread out your fan like this. Test your fan by quickly waving it around.

ACTIVITY STEP 9

For these next steps, it's helpful to have a partner.

ACTIVITY STEP 10

Now, you'll put it all together. Each of you carefully set the roof on top of the base of the house. It should look like this when you're finished. Go to the next step when you've got this.

ACTIVITY STEP 11

You and your partner choose which house you're going to test first. Don't worry, you'll test both houses eventually.

ACTIVITY STEP 12

Take turns waving your Wind Maker at the house. Can you blow it away?

ACTIVITY STEP 13

You and a partner get these worksheets and materials. You and your partner each need a set of worksheets, but you'll share the other materials to improve your house. These materials you see here on the right are all the materials you're going to have for improving both of your house, so use these materials carefully. Once you've got everything you see here, go to the next step.

ACTIVITY STEP 14

Get your worksheet and answer all of question number one.

ACTIVITY STEP 15

Using these new materials you have, can you and your partner come up with a way to keep your house from blowing away? Build your first design and test it by waving your Wind Maker. If you can't think of any ways to use your materials, there are some ideas on the next slide.

ACTIVITY STEP 16

Here are some videos to help you come up with ideas, if you need them.

ACTIVITY STEP 17

Do question number two. Draw what you designed, and describe what happened when you tested your design.

ACTIVITY STEP 18

How did your first house do? Are there things that you want to try differently? Build and test your second design, and do question three on your worksheet.

ACTIVITY STEP 19

Now that you and your partner have both tested two different houses, it's time to decide: which of your designs worked better and why? Answer question number four. If both of your designs worked, think about these things: which one was easiest to build? Which one used the fewest materials? And which one do you think would last the longest in the wind? Make sure to explain your reasoning.

WRAP-UP VIDEO

In the activity, you did what a construction engineer does: you created a model, and then you used that model to design solutions to a problem. Now, in real life, the next step would be to actually go out and try those solutions on a real house. For the roof, here's one solution we

came up with: using stickers to stick the roof to the walls of the house. And you know what? There's a version of this in real life. It's a special kind of glue called sealant. It fills all the gaps between the roof and the frame of the house to keep the roof sticking tightly to the house. But there's always more than one way to solve a problem. Here's another solution we came up with: using paperclips linked together to attach the roof to the house. In real life, you could use something similar, like these special nails. They're a combination of a nail and a screw. They're the shape of a nail, but they have the grooves along them like a screw. That makes them harder to pull out than regular nails. Their grooves catch on the wood, holding it tight during a windstorm. Now how about solving the problem of your whole house blowing away? Well, here's one solution we came up with. We connected toothpicks from the house to paper clips on a sheet of paper under the house. This is like in real life what's called a foundation, the part of the house that actually goes into the ground. Foundations are usually made of cement, and they have metal rods inside that connect the house to the cement. That makes the house less likely to blow away. You can think like an engineer by looking for new ways to solve problems. Have fun and stay curious!