Lesson: “How could you survive a landslide?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Tornadoes, wildfires, floods, earthquakes—these are what we call "natural hazards," and these are ones you know something about. You could probably think of others you know about—hurricanes, avalanches, tsunamis. Hi, this is Doug. All of the natural hazards I've mentioned get lots of attention on the news. Today, I want to tell you about a hazard that doesn't get much attention, but it should because it's much more dangerous than many people realize. This natural hazard has something to do with rocks falling from the mountainside. I'm talking about landslides. In one of my favorite books, there's a story about a family that experienced a landslide. They're named the Genofile family, and they lived right around here on a mountainside near the city of Los Angeles, in California, USA. One night, they woke up to the sound of thunder. A storm was raging outside. Outside of their house, something like this is what was going on. Now, that's not a river of water going by. It's more like a river of land, actually. There's mud. There are pebbles. You see all that? There are rocks in there. Look at all those rocks. You see that? Look at how big some of those rocks are. That's a boulder, right there, that's going by. But for the Genofile family, this wasn't just happening outside their house. Imagine all of this flowing into your house. That's what happened to the Genofile family that night. Rocks smashed through the bedroom wall of their two teenage children, Jackie and Bob. And boulders like this started filling up the room. As more and more boulders tumbled in, their

beds were rising. By the time the landslide had finished crashing through their bedroom wall, their beds had been lifted up so high that Jackie and Bob could press their palms against the ceilings. Amazingly, everyone survived. When all was said and done, the Genofile family walked out of their house and looked around the yard. Boulders and cars were everywhere. There were even a few cars in their swimming pool. Landslides don't just happen in the mountains next to Los Angeles. They could happen near any mountains. But what causes a landslide? What causes loose bits of rock to all come rushing down a mountainside? Why do you think all the rocks came down at once?

EXPLORATION VIDEO 2

Up on the tops of mountains, there are lots of loose rocks and boulders. You learned how they break loose. It's things like freezing water and plant roots that can break the solid mountain rock apart into smaller pieces. Now, normally, after that happens, those loose rocks stay where they are. But when it rains, that makes the mountainsides slippery, and so when that happens, it's possible for lots of loose rocks to slide down the mountain all at once. So rain is one of the things that causes landslides. Watch this video taken in Taiwan. You can see it's raining. There are cars driving on a mountain road. You see the mountain on the side. Now keep your eyes on the white car in front. I'm not going to say anything more. Just watch that. Can you imagine if that was you in that car? Incredibly, no one was hurt. But still, what are the chances of something like this happening? Well, let's look at this slope. If a hill or a mountain is only slanted this much, that might not be enough to get a loose rock rolling. But if it's slanted this much, any loose rocks are much more likely to start rolling downhill now, aren't they? Scientists have measured the slant, or the slope, of mountains like this. And angles of about 35 degrees or more are usually what worries them the most. Less than an angle of 35 degrees and any rocks

that come loose might just sit there forever. But at around 35 degrees, that's an angle that, when wet, now any loose rocks tend to come tumbling down. Surprisingly, the worst kind of landslides occur with rocks that have already tumbled down the mountain, like this pile of loose rocks right here. You might think, well, if they've already tumbled, then everything's good, right? Where else could they go? But consider an example from real life. Like, you see this other little slope right here, that's a bunch of loose rocks. They've all tumbled down the mountain, and now it's its own steep hill. There's even a little forest of trees growing on that one. See? Here's a close-up. Well, in Japan, there was a steep hill like this, where someone had built a road. And here's the actual view when standing on the road. This video was taken at nighttime. It had recently stopped raining, but it had rained a lot in the previous days. And you see what's happening? Look at that. There goes the power line, and there goes an entire forest of trees right past the view there. Wow. Just to show you. If you were to look at something like this the next day, this is what a hill looks like after a landslide like that the next day. You could see the whole side just slid off. Do you notice the trees down there at the bottom? They used to cover the whole side of this hill. A landslide similar to this one happened in Washington state in the US in 2014, killing 43 people. So landslides are a big deal. Now that you know something about landslides, you might have some idea of how to be safe. Say you were trying to decide when and where to go camping in a hilly area. What kinds of things might affect whether a landslide would occur?

ACTIVITY INTRODUCTION VIDEO

In this activity, you're going to come up with a design to help people deal with landslides. It's a good thing you know something about landslides now. You're going to need it because today is your lucky day. Congratulations. You've just won a house in the Slide City Sweepstakes. It's a charming little yellow cottage right by the beach, but there's a problem. Your new house is

located right here in Slide City. A few years ago, this landslide tumbled downhill, destroying a dozen homes. Luckily, it stopped right before it hit your new house. But it was a close call. You'd like to move into your new house, but you're worried that there might be another landslide. How can you protect your house from a landslide? To solve a problem like that, you're going to have to think like an engineer. Engineers are people who solve problems by designing and building things. The problem you need to solve is: how can you protect your house from a landslide? Maybe you are thinking, I have no idea where to start. That's OK. Almost everyone feels stuck when they first tackle a problem like this. To get unstuck, engineers use something called brainstorming. In a brainstorm, the goal is to quickly come up with lots of ideas for how to solve the problem. A brainstorm is not about judging ideas yet. We're not trying to decide which ideas are good or bad. In fact, in a brainstorm, there really are no bad ideas. All ideas are good ideas. Even ideas that sound silly and crazy are welcome because sometimes it's the crazy ideas that lead to the best solution. Your class is going to have two brainstorms, and then you'll pick an idea, the one that you like best, and you'll draw up a plan for your home. To do your first brainstorm, your teacher will give you each some Post-it notes, and you'll also need a pencil. So we'll pause while you get those supplies. When you have an idea about how you could protect the house, write it down in a few words. Then raise your hand, and your teacher will take your idea and read it aloud to the class. Then the teacher will stick it up on the board like this, so that everyone can see it. OK, you're just about ready to get started. Here's the question you're trying to answer. How can you protect your house from a landslide? Here's your house. That's the house you're trying to protect. I'm going to add a timer for three minutes. That's how much time you'll have to do the first brainstorm. When the timer begins, start writing down your ideas and hand them to your teacher. Are you ready? Your time starts now. Go. Time's up. We'll pause so your teacher can get the last few Post-its up on the wall. When that's done, hit Play to continue.

How did you do? If your brainstorm went well, you have a lot of ideas for protecting your house. Now, we're going to look at this problem from a completely different point of view. In this brainstorm, brainstorm number two, you're going to think about a slightly different question. How can you stop a landslide before it starts? You don't want any rocks to fall ever again. If you can keep that from happening, you do more than just protect your house. You'd save the town, too. You'd be the hero of Slide City. So let's look at a simple drawing of the town and figure out what started the landslide in Slide City. Here's the mountain, and here's the town. In the days before the landslide, it was raining a lot. And a house at the top of the hill was also watering its lawn a lot, so all this water made the hillside very slippery. And the hill itself is covered in loose rocks. There's been a lot of root wedging and ice winching going on here. And most of the hill is really slanted, which means the rocks will slide if they get wet enough. So are you ready to brainstorm again? This time, your class' job is to come up with answers to this question—how can you stop a landslide before it starts? Thinking about the reasons why the rocks slid might help you come up with some ideas. OK. I'm going to add a timer again. When the timer starts, you'll have three minutes to generate as many ideas as you can. You ready? Start writing. Time's up. We'll pause so your teacher can get the last few Post-its up on the wall. When that's done, hit Play to continue. Well, congratulations, your class has completed two brainstorms. So now, it's time for you to make a plan to save your house in Slide City. You have all the ideas in both brainstorms to choose from. You can pick out one or more than one that you think will be best. Each person can pick a different idea. The whole class doesn't need to agree. And the idea you choose doesn't have to be the one you thought of. You can even take a few different ideas and put them together. There's just one rule that you have to follow when you're figuring out what you're going to do. In the brainstorm, any idea was a good idea, we said, because it got you thinking about all the different possibilities. But now, the idea you choose can't be too silly. In other words, it

should be something you or the town could actually afford to build or do. So think about all the ideas you've heard today and decide what you want to do. Your teacher will now hand out the design sheet, where you can write down your plan and draw a sketch of how you save your house in Slide City. After the class is done, you're going to do a show and tell of your designs. When you're ready, just click the arrow on the right for instructions.