Lesson: “How could you send a secret message to someone far away?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! What's the farthest away you've ever talked to someone? I don't mean like yelling across the playground. I mean like on a phone. Maybe you have a family member or a friend who lives far away. Maybe someone who lives even in another country. You could call them on a cell phone. You can even talk to them on video chat, like FaceTime or Skype. When I was a kid, growing up in the 1980s, iPads hadn't been invented. Even cell phones weren't really a thing yet. Almost nobody had cell phones, and if you did, they were really big like this. And they definitely didn't have video chat. If you could go back in time and show people an iPad back then, they would've been amazed. And if you could show people video chat, they would've been like, wow, something from the future. That's incredible. Back when I was a kid, I had a great-grandmother who lived too far away from me in order to walk to her house. So if I wanted to talk to her, I had to call her up on the telephone. No video, just our voices. But when my great-grandmother was a kid, almost nobody even had telephones then. Telephones had just been invented when she was a kid. And they were really expensive. If my great-grandmother wanted to talk to any of her family who live far away, well, she couldn't. The best she could do was to send them a written message like a letter. Today, we're all so used to being able to call up anyone, no matter how far away they are. But every device we use to talk to people, whether it's a cell phone, or an iPad, or even the kind of phone I had when I was a kid, all of these things

had to be invented. People didn't always have these things. Imagine if you lived way, way back in time before there were telephones—before there were even letters or mail. How would you talk to or communicate with someone who lived far away? What would you do? Well, the simplest idea might be to just try yelling. Hey! But that only works for so far. And then imagine if everyone around you was doing that too. That would get loud. Now, you might say, well you could just invent a telephone, but telephones work using electricity, something that hadn't been discovered yet. So what could you do? Think about it. We could even make this a little simpler. Instead of using sound to send a message, what if you used light to send a message? Like, let's say you wanted to send a very simple message. A simple yes or no to a friend of yours who lived down the block from you. How could you use light to do that?

ACTIVITY INTRODUCTION VIDEO 1

If you wanted to communicate yes or no to someone using only a light, you could turn the light on to mean one thing, like yes. And turn the light off to mean another thing, like no. Or maybe you thought of a different idea. Yes, could be one flash. No could be two flashes. There's more than one way to solve this problem. It might seem silly to you to use lights to communicate. But you know what? We do this in real life. Does this look familiar? Each color of the lights sends a message to the person driving a car. You know what the colors mean, right? Green means go. What about this light? Well, you probably know this one means stop. So when you see this light, cars need to stop moving. All right. Now I'm going to show you another light. This is a tricky one, this next one. Some grownups don't even know what this one really means. What does this light mean? Do you know? I'll pause a moment if you want to try to guess. Okay. This yellow light means to be careful and to prepare to stop because a red light is coming. Let's practice using these light messages by pretending that you're driving a car.

ACTIVITY PART 1 STEP 1

We're going to play a little game. Stand up and find some space to move. When you're done with this step, click the arrow on the right.

ACTIVITY PART 1 STEP 2

Pretend you're a car. Put your hands on the invisible steering wheel in front of you, and start your engine by making quiet engine sounds like this. [VROOM, VROOM] Now let's practice following the messages communicated to us by the lights. You know that when there's a green light that means go. Run in place, like this. But the yellow light is coming. When it's yellow, that message means slow down, like this. And when you see a red light, stop your car. Okay! Go to the next slide and we'll start the game.

ACTIVITY PART 1 STEP 3

Watch for the messages the light is sending and do what the light says. You're at a red light, you ready? Go! All right, you made it. Go ahead and sit down, and watch the next video.

ACTIVITY INTRODUCTION VIDEO 2

In today's activity, you're going to send a secret message using light. When you were pretending to be driving a car, you got messages from the traffic lights. Green told you to go. Yellow told you to slow down. Red told you to stop. Now you are going to figure out how to send your own messages using colored lights. Let's say you want to send a message to your friend who lives across the street. The problem is you don't have a cell phone or an iPad, and it's nighttime, so you don't want to go knock on your friend's door or yell. Your friend's little brother is already in

bed. In the classroom, you and a partner will come up with your own secret code that you can use to send a simple message to your partner. You can use your secret code to tell your partner to do things like hop on one leg, or bark like a dog, or do a thumbs up, or anything you can imagine. You'll be given three different colors. Each color can mean something different. And remember, your colors don't have to match a traffic light. Instead of meaning stop, red could mean hop on one leg, or it could mean jump up and down. Now, your partner will be on the other side of the room when you use your secret code to send a message, so just be sure that whatever your code tells you to do, your partner can do it by themselves. What will you come up with? I'll show you how to get started, step by step.

ACTIVITY PART 2 STEP 1

Find a partner. When you're done with this step, click the arrow on the right.

ACTIVITY PART 2 STEP 2

Get your supplies. You'll get more later. Each person will need a worksheet and each group will need red, green, and blue markers.

ACTIVITY PART 2 STEP 3

Completely fill in each circle on your worksheet with a different color. The darker you make them, the better. It doesn't matter what order the colors go in, as long as you do all three colors. It's okay if you go over the lines a little.

ACTIVITY PART 2 STEP 4

Talk with your partner to come up with what each color should mean. What messages do you want to send? For example, one of the messages could be, wave to everybody.

ACTIVITY PART 2 STEP 5

Write down what each color means. Make sure you're writing your messages next to the same color your partner is.

ACTIVITY PART 2 STEP 6

Get two flashlights—one for you and one for a partner. Make sure they both work.

ACTIVITY PART 2 STEP 7

Hold your worksheet up with one hand and shine your flashlight over the different colored circles. Can you see the color coming through the other side of the paper? Try moving your flashlight closer and farther from your worksheet. Does anything change? What position would make the best signal?

ACTIVITY PART 2 STEP 8

Take a few seconds to decide between you and your partner who's going to be the first one to be the Sender and who will be the Watcher. Now don't worry, you'll both have a turn at each job. Okay, you ready to take a few seconds and decide? Go ahead now. Okay, have you decided? Go to the next slide.

ACTIVITY PART 2 STEP 9

It's time to turn off the lights and cover any windows.

ACTIVITY PART 2 STEP 10

Both of you, go to opposite sides of the room. Don't forget to bring your worksheet and flashlight.

ACTIVITY PART 2 STEP 11

Here's how it will work. Sender, send one message using your worksheet and flashlight. For example, this Sender is sending a red light. Watcher, do what the message says, like maybe red means spin. So the Watcher should spin. After you send one message, go to the next step.

ACTIVITY PART 2 STEP 12

Switch roles and do it again. Then, keep going. Each person does three turns. Do whichever colors you'd like. When each person has gone three times, then go to the next step.

ACTIVITY PART 2 STEP 13

Sit down and discuss. After you discuss these questions, advance the slide to watch the final video.

WRAP-UP VIDEO

So how could you come up with more than three messages using just three colors? Well, there are lots of different ways to solve the problem. Here are two ideas we came up with. For one of our ideas, we used a flashing light to mean something other than a solid light. For example, while you might have a solid red light mean wave your hands, a flashing red light could mean something different, like jump on one foot. Here's another idea we had. What if you switched quickly back and forth between two colors to mean something different. For example, if green means jump and blue means spin in a circle, then maybe switching back and forth between the green and blue could mean put your hands on your head while spinning in a circle. Now all of what we just did was useful for communicating to a friend in the room or a friend across the street. But what if you wanted to send a message using light to an entire city? Well, let me tell you one last story. It might help get you thinking about some new ideas. There was once an inventor who invented a giant flashlight that he could use to shine a message up onto the clouds. Now, this is true. This really happened. He called this invention the sky projector. His dream was to be able to send messages to everyone in a town using this giant flashlight. For example, he tried to project the time up onto the clouds to act like a clock so that everyone in the town could always know what time it was. He even used his sky projector to send holiday greetings to everyone during the winter season. But the sky projector turned out to cost too much money. It needed lots of electricity for a light that was so bright and it was really heavy. So it was decided not to make any more sky projectors. But the idea of the sky projector really excited people. It got them thinking. It led the creators of a comic called Batman to come up with the idea for the now-famous bat signal if you've ever heard of that. In the story of Batman, when the city of Gotham needs Batman's help, they turn on the bat signal, a giant light that has the

shape of a bat over the light, so that Batman can look up and see when he's needed. Maybe you can think of a way to make your own bat signal. What kind of message would you want to send to an entire city? Think about that. Have fun and stay curious!