Lesson: “Can selection happen without people?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hi, it's Doug! You know that human beings have gotten good at changing how animals look. We saw how people took a wolf-sized dog and over many years, over many generations, turned it into all kinds of different breeds. Small dogs, huge dogs, spotted dogs. It's the process you learned about, called selection, but are there other things that might make selection happen? Could selection happen without human beings involved? By the end of today, you'll be able to figure out the answer to that question. In order to find out the answer, you're going to play a game. It's called Lizard Island. Even though it's just a game, it's based on a real place using real work that was done by scientists. The game involves a story about creatures like these. Have you ever seen these kinds of lizards? They're lizards that can actually climb directly up the side of walls or trees. This one's climbing up a wall. The most famous of these, like this one, are called *geckos*. I say they're famous because you can usually find them in any pet store and they even show up in some TV commercials. But there's another kind of lizard that can do this too, similar to a gecko. It's a lizard called an *anole*. Now, if you've ever been here to the US state of Florida, home of Disney World, then it's hard not to notice anoles as you walk around because they are everywhere. In Florida, there's actually two totally different kinds of anole. And we're going to talk about both of them. One is a big, brown kind of anole and it's called the *brown anole*. The other is a smaller green one and it's called the *green anole*. And this is what our

game is all about. You see, one of these species didn't always live in Florida. Before the year 1941, there was just this, the green anole, not the brown anole. The brown anole came from an island nearby. And as you can see in this video, green anoles eat insects. Got it right there—yummy cricket. And green anoles are also climbers and they're able to go high up into the trees if they need to, whether that's to find more insects to eat or to get away from a predator. What makes them good climbers like any climbing lizard is that they have these sticky scales on each of their toes. That's what you're seeing here. But in 1941, the brown anoles arrived in Florida. They eat insects too. There's one problem, though: brown anoles are big enough that they don't just eat insects. They also can eat green anoles. Now, I know what you might be thinking: oh, poor green anoles. Luckily for the green anoles, the brown ones aren't as good at climbing. See, on their feet, brown anoles don't have nearly as many of those sticky toe scales. So without all the sticky toe scales that green anoles have, brown anoles just don't climb as well and they usually stay close to the ground. Green anoles, on the other hand, usually have around 20 or more of these sticky toe scales on their big toe alone. So, in general, green anoles are better climbers than brown anoles. Once the brown anoles arrived in Florida, what do you think happened to the green anoles?

EXPLORATION VIDEO 2

What do you think happened to the green anoles once the brown anoles arrived? You're going to try to figure out the answer to this question yourself. You know an important clue already. Remember this idea? No two individuals are exactly alike. So not all green anoles have the exact same number of sticky toe scales. That means even though all green anoles can climb up into the trees, some green anoles are better climbers than others. Because some green anoles have more sticky toe scales than other green anoles. The more sticky toe scales a green anole

has, the better it climbs. In order to find out how well any green anole can climb, we've got to catch it and count its sticky toe scales. We need to do that for the green anoles that are on the island before the brown anoles arrive. That's what we'll do in the game. Let's start.

ACTIVITY INTRODUCTION VIDEO 1

In today's activity, you're going to play a game called Lizard Island. Lizard Island is a real island off the coast of Florida. It's an actual place. This is a true story. Like I said before, some green anoles were living on the island when the brown anoles arrived. We're going to play this game to see what happens to the green anoles when the brown anoles are introduced—but before we introduce the brown anoles, we'll need to count the sticky toe scales of the green anoles that are there. Now, if you're working alone or with a small group, use the small group instructions linked below this video. If you're in a class, I'll walk you through the game step by step. Are you ready?

ACTIVITY PART 1 STEP 1

Get your first set of supplies. When you're done with this step, click the arrow on the right.

ACTIVITY PART 1 STEP 2

On your card is a close-up of your lizard's big toe. Count the toe scales to figure out how well your lizard climbs. We've drawn lines for you pointing to each sticky toe scale. Write numbers next to the lines as you count, like this. Count carefully. The number you get may not be the same number as the person sitting next to you.

ACTIVITY PART 1 STEP 3

Now you're going to notice as you count the scales that not everyone's lizard has the same number of scales. Some of them have 19 to 22 scales. Those are the good climbers. But some of them have 18 or fewer sticky toe scales. Those are the not-so-good climbers. And then some of you lucky lizards have 23 or more scales. Those are the excellent climbers. Go ahead now. At the bottom of the card, circle what kind of a climber your lizard is based on its toe scales.

ACTIVITY PART 1 STEP 4

Raise your hand if your lizard is an excellent climber. Have someone count the hands. Remember this number for the next step.

ACTIVITY PART 1 STEP 5

Record the number of excellent climbing lizards here. This helps you remember how many excellent climbing lizards there were before any brown anoles arrive.

ACTIVITY PART 1 STEP 6

Raise your hand if your lizard is a good climber. Have someone count the hands. Record that number on your “How Many Lizards?” sheet.

ACTIVITY PART 1 STEP 7

Raise your hand if your lizard is a not-so-good climber. Have someone count the hands. Record that number on your “How Many Lizards?” sheet.

ACTIVITY PART 1 STEP 8

Now that you and everyone else in your class has counted the toe scales, you know how many lizards are excellent climbers, how many are good climbers, and how many are not-so-good climbers. We're going to find out how many lizards are in each group and make a graph from the numbers. Scientists often use numbers to make a graph. For example, this is a graph showing what kinds of pets are most popular. A graph changes a set of numbers into a picture or a pattern. This pattern can help you understand the numbers in a new way. So let's try this for our lizard groups. Go to the next step.

ACTIVITY PART 1 STEP 9

Now that you know how well all the lizards can climb, make a graph from the numbers. Color in one box for each excellent-climbing lizard. Do the same for the good and not-so-good climbers.

ACTIVITY PART 1 STEP 10

This is what our graph looked like. Yours probably looks similar. Each box stands for one green anole. Discuss these questions, and watch the next video to see what happens.

ACTIVITY INTRODUCTION VIDEO 2

OK. It's time to find out what happened to the green anoles when the brown anoles arrived. First, let's look at the group of green anoles that are the not-so-good climbers. The not-so-good climbers had a hard time getting away from the brown anoles. They just couldn't climb high enough or quickly enough. Many of them got eaten by the brown anoles. You'll find out exactly how many lizards in your class got eaten in just a minute. But let's find out about the other

lizards too. What about the group of green anoles that are the good climbers? Well, they were better at getting away from the brown anoles, but a few still got caught. OK. And what about the group of excellent climbers? They climbed high and fast and almost all of them got away. OK. So let's get back to the game and see what this does to our graph.

ACTIVITY PART 2 STEP 1

OK, now we're going to take away some lizard cards, since some of the lizards got eaten. We'll start with the not-so-good climbers. If your lizard is a not-so-good climber, stand up and count off like this: 1, 2, 3, 4, 5, 6, 7, 8, and so on. Now, everybody remember your number when you count off. When you're done, go to the next slide.

ACTIVITY PART 2 STEP 2

Take away the cards for all the not-so-good climbing lizards except numbers 5 and 10. Those lizards didn't get eaten. If your lizard got eaten, quickly draw a sad face on your card. Then hand it in to your teacher. Your lizard is no longer in the game. But don't worry, you'll get another lizard soon.

ACTIVITY PART 2 STEP 3

OK, now we're going to take away some good climbers. Even though they could climb pretty well, remember brown anoles still ate some of the good climbers. Good climbers, stand up and count off. Remember your number, and go to the next slide when you're done.

ACTIVITY PART 2 STEP 4

OK, now take away all the odd-numbered lizards. Those lizards got eaten. Only the even-numbered lizards survived. If your lizard got eaten, quickly draw a sad face on your card, then hand it in to your teacher. Your lizard is no longer in the game. But don't worry, you'll get another lizard soon.

ACTIVITY PART 2 STEP 5

Brown anoles caught very few of the excellent climbers. Excellent climbers, stand up and count off. Remember your number. And when you're done, go to the next slide.

ACTIVITY PART 2 STEP 6

OK, now take away cards 5 and 10. Those poor lizards got eaten. But the rest survived. If your lizard got eaten, quickly draw a sad face on your card. Then hand it in to your teacher. Again, your lizard is no longer in the game. But don't worry.

ACTIVITY PART 2 STEP 7

The brown anoles ate lots of green anoles! But the better climbers got away. Discuss.

ACTIVITY PART 2 STEP 8

Everyone who still has a lizard card, stand up and find a partner who also has a lizard card. If there's a lizard with no partner, your teacher will give a lizard card to one more person so that everyone has a partner.

ACTIVITY PART 2 STEP 9

If you don't have a lizard card anymore, join one of the pairs. Make groups of four: two people with lizard cards, and two without. If you don't have enough people, that's OK. You can have a group of three, as long as you have two lizard cards.

ACTIVITY PART 2 STEP 10

Each “Adopt a Lizard” card stands for a lizard parent. Now get a “Baby Lizard” card for each person in your group, even people who have parent lizard cards. So, groups of four need four Baby Lizard cards.

ACTIVITY PART 2 STEP 11

Now your group will figure out what the babies of those lizard parents are like. The babies will be like both the mother lizard and the father lizard. On the Baby LIzard cards, do steps one, two, and three. You're going to write in the number of toe scales each parent has. Add those numbers together, and then divide that by two. The answer tells you how many toe scales the babies will have.

ACTIVITY PART 2 STEP 12

Now you know how many toe scales your baby lizard has. Figure out what kind of climber the baby lizard is. Is it an excellent climber, a good climber, or a not-so-good climber? Circle the answer.

ACTIVITY PART 2 STEP 13

Hand in all the parent lizard cards now. The parent lizards have died of old age, leaving only baby lizards on the island. Once all the parent lizard cards are handed in, go to the next step.

ACTIVITY PART 2 STEP 14

Now let's see if the baby lizards are different from the original parent lizards. Raise your hand if your baby lizard is an excellent climber. Write down the number of hands raised on the “Baby Lizards” side of this handout.

ACTIVITY PART 2 STEP 15

Count the good and the not-so-good climbers, and write those numbers on the “How Many Lizards” sheet too.

ACTIVITY PART 2 STEP 16

Make a graph of the baby lizards, just as you made a graph before.

ACTIVITY PART 2 STEP 17

What happened after the brown anoles arrived? Compare the two graphs and discuss. Then, advance the slide to watch the final video.

WRAP-UP VIDEO

The invasion of brown anoles on Lizard Island has caused our groups of green anoles to change. More green anoles now have more sticky toe scales than many of them did before. All of this has been a lot like selection. Remember when the ancient Chinese royalty wanted tiny dogs? How did they get them? They chose the smallest dog they could find to be a mother, and then for the father, they chose the smallest dog as well. And so those two smaller dogs had small puppies. Then, the ancient Chinese royalty raised these puppies and took the smallest boy dog to be a father and the smallest girl dog to be a mother. And the puppies from those dogs were sometimes even smaller. So, after many generations, the baby dogs being born were now much smaller than the original medium-sized wolfdog. Well, back on Lizard Island, there were no people selecting which green lizards would be allowed to have babies. And yet there was a kind of selection going on, wasn't there? The brown lizards did the selecting. Now, unlike human beings, the brown lizards weren't aware they were doing any selecting. But they were doing selection. They ate the green lizards that were not-so-good climbers because those were the ones they could catch. But the brown lizards couldn't catch all of the excellent climbers and good climbers. So those lizards were able to have babies. And since babies tend to be like their parents, those babies had lots of sticky toe scales. So the green annuls have changed because of the brown anoles. Before the brown anoles came along, the green anoles spent more time on the ground, and only some of the green anoles were excellent climbers. But after the brown anoles invaded, now, because they've eaten up all the not-so-good climbers, a lot of the green anoles are good or excellent at climbing because they're the ones able to have babies. Now here's something that may surprise you: Lizard Island is a real place located in Mosquito Lagoon in Florida in the United States. And it's loaded with green anoles and brown anoles. As

we said, green anoles already lived in Florida. The brown anoles first showed up in Florida back around the 1940s. They're originally from the country of Cuba, but a few of them hitched a ride to Florida on cargo boats, which is how they get from one piece of land to another, such as an island: they ride on boats. So these big, brown lizards, they made themselves at home in Florida. Scientists saw that the brown anoles were taking over places where the green anoles lived. And they worried about the green anoles. Would the brown anoles eat all the green ones? Or maybe would the brown anoles eat up all the bugs, leaving the green anoles to starve? One of the scientists who wanted to find out the answers to these questions was this guy, Todd Campbell. He knew that there were a few islands in Mosquito Lagoon where only green lizards lived. This allowed him to see exactly what would happen if he let the brown lizard invade. Because these lizards don't like to swim across the water, an island acts like a cage, keeping the lizards in one place for scientists to study them. We decided to call these scientists and ask them a few questions about what they did and what they found out. If you want to learn more about them, check out the link after this video. Here's a picture of the two scientists who studied the lizards of Lizard Island. They're boating from one island to the next, ready to catch lizards and count their toes scales—just as you did.