

Modeling Natural Selection

How can environmental change make some inherited traits more common?

LEARNING GOAL

I can use evidence to explain how environmental conditions can make some inherited traits more common in a population over time.

1. Engage: The Island Birds

A population of birds lives on an island. Some birds have narrow beaks, while others have wide, strong beaks. For many years, the island has plenty of small, soft seeds. After a long drought, most of the small seeds disappear. The remaining seeds are larger and harder to crack.

Think about it:

1. Which birds might collect food more successfully after the drought?
2. Will individual birds change their beaks because they need to?
3. What might happen to the population over several generations?

2. Learn: How Natural Selection Works

Variation: Individuals in a population have different inherited traits.

Environmental pressure: Conditions create challenges, such as limited food.

Differential survival and reproduction: Some traits help organisms survive and reproduce more successfully.

Inheritance: Helpful inherited traits are more likely to be passed to offspring.

Population change: Over many generations, those traits can become more common.

IMPORTANT

Individual organisms do not change inherited traits because they need to. Natural selection changes populations over generations.

3. Worked Example

Beak trait	Before drought	After several generations
Narrow beaks	60 birds	25 birds
Wide beaks	40 birds	75 birds

Evidence-based explanation: Wide-beaked birds were better able to eat the large, hard seeds available after the drought. They were more likely to survive, reproduce, and pass the wide-beak trait to their offspring. Over several generations, wide beaks became more common.

4. Hands-On Simulation

Materials: spoon, tweezers, dry beans or pasta, small beads or rice, two cups, tray, and timer.

Procedure

1. Scatter both food types on a tray.
2. Use the tweezers for 30 seconds and count the pieces collected.
3. Return the food and repeat with the spoon.
4. Change the environment so only one food type remains.
5. Test both beaks again. Record and compare the results.

Beak type	Mixed food	Large food only	Small food only
Tweezers			
Spoon			

5. Analyze the Evidence

1. Which beak was most successful in each environment?

2. How did changing the available food affect the results?

3. Which birds would probably produce more offspring? Use evidence.

4. What might the population look like after ten generations?

5. Did the less-successful birds change their beaks? Explain.

6. Evidence-Based Written Response

WRITING PROMPT

Explain how a change in the island's food supply could cause one beak trait to become more common over several generations.

Your response should include: variation in the population; the environmental change; differences in survival and reproduction; traits being passed to offspring; and evidence from the simulation.

7. Quick Assessment

Which statement best explains natural selection?

- A. Organisms develop new traits whenever they need them.
- B. Helpful inherited traits can become more common over many generations.
- C. Every organism in a population develops the same traits.
- D. The environment chooses which traits an organism will develop.

Explain your answer: _____

TEACHER KEY

Quick assessment: B. Look for a written response that connects inherited variation, environmental pressure, survival and reproduction, and population change over generations.

Teacher Notes

Suggested timing: 45-60 minutes

Preparation: Set up one tray and two collection tools for each student pair. Choose food items that differ clearly in size.

NGSS connection: MS-LS4-4 - Construct an explanation based on evidence that describes how genetic variations can increase some individuals' probability of surviving and reproducing in a specific environment.

What to Look For

Strong student explanations should:

- describe inherited variation that already exists in the population;
- identify the drought and changing seed supply as environmental pressures;
- connect feeding success to survival and reproduction;
- explain that successful birds pass traits to offspring; and
- describe population change across multiple generations.

Common Misconception

WATCH FOR

Students may say birds developed stronger beaks because they needed them. Ask: Did an individual bird change, or did birds with an existing helpful trait leave more offspring?