

Birds, Beaks, and Natural Selection—A Simulation

Objective

Students will learn about the role of mutations in natural selection and evolution.

Time

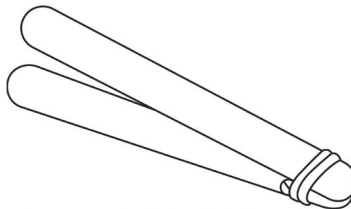
This lesson was designed for two to three 50-minute periods.

Materials

- Teaching Evolution Case Studies: Bonnie Chen -- an extended version of this lab (Teachers Guide Resources)
- Bird beak materials: wooden tongue depressors (2 per student); 1.5" screws and rubber bands (1 per student)
- Long wooden tongue depressors (2 depressors glued end to end), enough for long beak mutations
- Scissors (1 per team)
- Aquarium or clear plastic container with water level to at least 15 cm (1 per team)
- Simulated food items (4 of each kind/student) For example, floating (balloons with sugar or sand plus air), middle layer (balloon with sugar or sand plus air), middle layer (balloon with sugar or sand, screw, and little air), and sinking food (sugar or screws)
- “Birds, Beaks, and Natural Selection” handout, “Bird, Beak Data Sheet” (1 per person) and “Mutation” handout (1 per group)

Procedures

1. Group the students into three to four person teams that represent wading birds within a large population with wild-type beak made of tongue depressors.
2. Show students the wild-type beak model and ask them to construct similar beaks following the directions on the “Birds, Beaks, and Natural Selection” handout.



3. Explain that students will simulate the wading birds feeding. Instruct them to follow the feeding directions on the “Birds, Beaks, and Natural Selection” handout.
4. Have students compare the average number of food pieces and types of food captured by the team members.
5. After the first set of trials, explain that some birds will undergo mutations in the genes that code for beak length. Have each student pick a folded section of the mutation handout that will explain the kind of mutation and how it will affect the beak size of their offspring.
6. Tell students who received a beak mutation that requires a change to create a new beak for their offspring.
7. Have students now feed as if they were the offspring, Generation 1. Because this time *all members of a group will feed at once* to demonstrate competition for resources, two teams will work together during the feeding of the offspring. While one group feeds, the other group will time and monitor the feeding. Then teams will switch roles. There will be three feeding trials and students will record their feeding data on the “Bird Beak Data Sheet” after each trial.
8. Have students determine the survival rate of their offspring by following directions on the “Bird Beak Data Sheet.”
9. Have students compare their data and answer the questions on the “Birds, Beaks, and Natural Selection” handout. Ask teams to share their answers in a class discussion. Ask students if the data turned out as they expected. Have students consider and discuss what variables might have affected their data.

Adapted with permission from “Genetics and the Evolution of Bird Beaks” by Bonnie Chen.