

Historical Lesson: Grade 8

Charles Darwin and the Reproductive System

Objectives:

- Students will relate Darwin's theory of natural selection to the reproductive system.

Materials:

Prepare before the lesson:

- two piers
- 3 bags of rice (enough to fill 2 cool whip bowls)
- one cookie sheet
- 2 cool whip
- 2 cool whip bowl lids (each lid will need a small hole cut out of the top. NOTE: The hole needs to be small enough that if trying to get rice out fingers would only be able to get a couple pieces out)
- A teaspoon measurer
- Tape
- Picture of two birds that are exactly alike except for the size of their beak (See Figure 1 at the end of the lesson)

Vocabulary:

Natural Selection

Charles Darwin

Engage:

Show students Figure 1 (See Figure 1 at the end of the lesson) on the overhead. Have all the students individually write down as many differences as they can find between the two birds. Discuss.

Note: The only difference between the two birds is the beak size.

Explore:

Experiment one:

Tell students the following story. On a small island there are 4 birds. The birds are exactly alike except that two (one male and one female) have a very large beak and the other two (one male and one female) have a very small peak. (Same as the picture) Both birds eat rice and only rice. The two birds with the large beak are able to collect food at the same rate as humans could using the thumb and index finger. The two birds with the small beaks are able to collect food at the same rate as humans could using a pliers. One day the birds were looking for rice and a large pile of rice fell out of the sky. All four birds were very excited and began to eat the rice. At the end of three years all the rice was gone.

Do the Experiment:

Ask for four volunteers. (Two people to represent the large beak birds and two people to represent the small beak birds.) Put a cookie sheet with a large pile of rice on it. Let the large beak birds use their thumb and index finger to collect rice and the small beak birds use pliers to collect rice. Let the students collect rice for 30 seconds. After the time is up measure the rice with the teaspoon measurer. For each teaspoon of food the pair of birds were able to collect they were able to produce one offspring.

Graph the information. Use a red pen to represent the large beak birds and a blue pen to represent the small beak birds. See the graph below.

Example:

Parents = 2 birds

4 teaspoons of rice collected = 4 offspring

6 total birds (Graph 6)

3 pairs of birds

Experiment 2 (Or in other words year 2) and Experiment 3 (Or year 3): Repeat the experiment exactly as the first experiment. Graph the information. Note: Due to the fact that it would be hard for more students to come up to represent the offspring from experiment one some math will need to be used to calculate the number of offspring that would have occurred. Have the original pairs eat from the food source. Then calculate the number of offspring. Multiply the number of offspring by the number of calculated pairs from experiment 1.

Continued Example: Experiment 2/Year 2

Parents – 3 pairs

Offspring- 4 teaspoons collect by original 2 parents= hypothetically 4 offspring would be produced by each pair.

3 pairs X 4 offspring = 12 offspring

12 offspring + 6 parents (3 pairs) = 18 birds (Graph 18)

9 pairs of birds

Continued Example: Experiment 2/Year 2

Parents – 9 pairs

Offspring- 4 teaspoons collect by original 2 parents= hypothetically 4 offspring would be produced by each pair.

9 pairs X 4 offspring per pair = 36 offspring

36 offspring + 18 parents (9 pairs) = 54 birds (Graph 54)

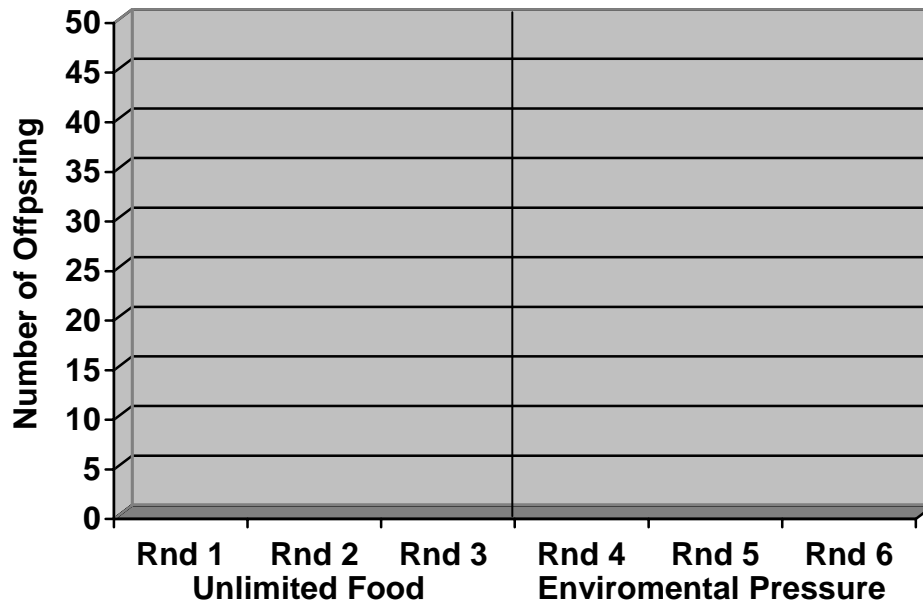
27 pairs of birds

Be sure to do this for both the large beaked birds and small beaked birds.

This demonstrates that if you are suited for your environment you will grow exponentially.

Note: this experiment does not account for deaths. Be sure to discuss this!!!

Graph all information. Example of graph below...



*** Experiment will continue in the expand portion of the lesson.

Explain: Put students in groups of 2 or 3. There are 10 topics to read about on the following website: http://en.wikipedia.org/wiki/Charles_Darwin . Assign each group a different topic. Groups must read the article and present the information to the class. You may choose to give each group poster board to present their informaiton.

Topics to assign each group:

- Early Life
- Journey on the Beagle
- Growing Reputation and inception of theory
- First publication, heart symptoms, and romance AND Marriage and children
- Development of the theory of natural selection
- Publication of theory
- Reaction to the publication
- Active into old age
- Religious Views
- Legacy

Have student groups present the information. Have students take notes. After all groups have present have each group come up with two test questions from their assigned reading. Collect each the test questions that each group wrote.

Expand:

Have a student look up the definition of natural selection and read it to the class.

Discuss.

What is the specific trait that is different between the two birds in the experiment we did earlier in the lesson? (the beak size)

Natural selection is the process by which individual organisms with favorable traits are more likely to survive and reproduce than those with unfavorable traits. It works on the whole individual, but only the heritable component of a trait will be passed on to the offspring, with the result that favorable, heritable traits become more common in the next generation. Given enough time, this passive process results in adaptations and speciation (see evolution). Definition taken from the following website:

http://en.wikipedia.org/wiki/Natural_selection

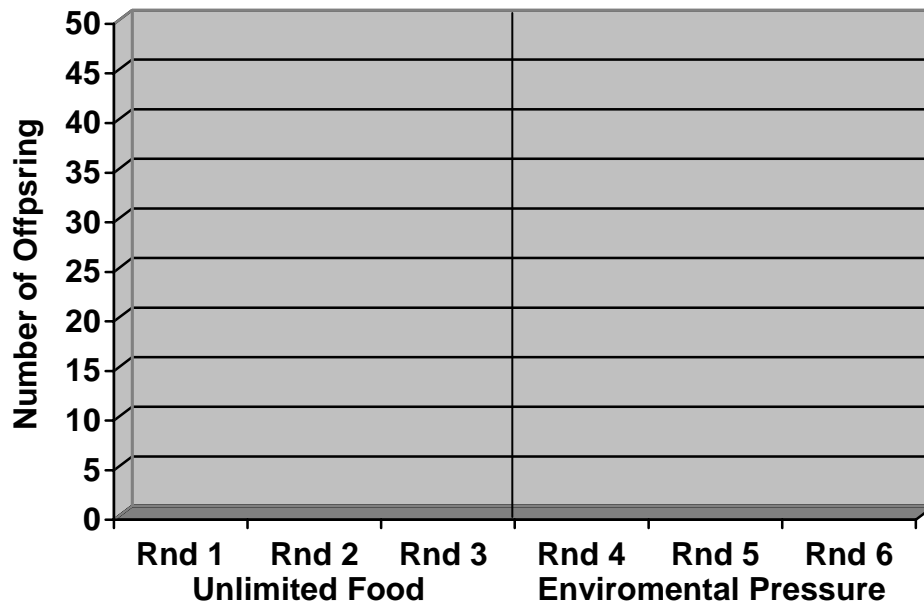
Repeat the story from the explore portion of the lesson and continue the story. On a small island there are 4 birds. The birds are exactly alike except that two (one male and one female) have a very large beak and the other two (one male and one female) have a very small beak. (Same as the picture) Both birds eat rice and only rice. The two birds with the large beak are able to collect food at the same rate as humans could using the thumb and index finger. The two birds with the small beaks are able to collect food at the same rate as humans could using a pliers. One day the birds were looking for rice and a large pile of rice fell out of the sky. All four birds were very excited and began to eat the rice. For each teaspoon of food the pair of birds were able to collect they were able to produce one offspring. Now the birds ate for three years off this pile. However, the pile is now empty. Food is scarce. The only place birds are able to find food is in the crevasses of rocks.

Using the same volunteers from the previous experiment, give each pair of “birds” a cool whip bowl with rice, using the lids that were prepared before the lesson.

Reminder: The hole in the cool whip bowl should be small enough that it is difficult for the “finger” group to collect rice.

Time the students and do the experiment 3 times. After each experiment cover more of the hole with tape. By the end make it so the finger group will not be able to collect any rice. Remember math will need to be calculated. Use the examples from the explore portion of the lesson. Remember: Start fresh from the beginning. In other words, two pairs of birds and calculate the number offspring. Compare the two graphs. There is a line drawn down the middle of the graph to represent a new experiment.

Fill in the following graph on the board as you do the experiment.



Questions:

What happened to the “finger” group (large beaked birds) when there was unlimited food and easy accesses to food?

What happened to the “finger” group (large beaked birds) as food got scarce and was more difficult to reach?

What happened to the “pliers” group as the hole got smaller?

How does this relate to Darwin’s Theory?

How does this relate to natural selection?

Discuss. Make connections. Discuss the connection between this experiment, Darwin, and the reproductive system.

Evaluate:

Create a test about Darwin using all of the student’s questions. Add additional questions that are needed. At the end of the test have students answer the following essay question. Students must write a one page essay answering the question. Describe the experiment conducted in this lesson. What did we learn from the experiment? What did the holes demonstrate? What did the pliers and fingers demonstrate? Lastly have the students relate the information from this lesson to the reproductive system. How does the information learned in this lesson relate to the reproductive system?

Figure 1 (picture of two birds –exactly the same except the size of their beak)