Quackers
Investigating Natural Selection

Charles Darwin published *The Origin of Species* in 1859. In his book Darwin presented two main concepts, descent with modification and natural selection. Descent with modification was the phrase Darwin used to describe how modern species arose from a series of ancestors through accumulated changes over time. The second concept, natural selection, is the process in which the organisms that are best adapted to a set of environmental conditions will survive long enough to reproduce. By reproducing, these organisms will pass the successful genetic information to the next generation. Those organisms that are not as well adapted are more likely to die. The overall composition of the population will change as the survivors with the more beneficial genes or adaptations produce more offspring.

Natural selection is sometimes referred to as 'survival of the fittest'. The organisms that are best adapted will be the parents of the subsequent generation. It is important to note that the organisms do not adapt to their environment. For example, in a desert setting, narrow leafed plants survive at a higher rate than a broad leafed, tropical plant would survive. The narrow leafed plant is better adapted and will survive to reproduce. The broad leafed plant would lose too much water and die before reproducing. The broad leafed plant can't adapt to the desert environment. The narrow leafed plants "become adapted", rather they possess adaptations that make them better suited for survival. An adaptation then is an inherited trait that gives an organism possessing that trait a reproductive advantage. When natural selection is occurring, those organisms that possess the adaptation survive at a higher rate than those that do not possess the adaptation.

PURPOSE
In this activity you will simulate the events of natural selection. The population experiencing natural selection in this simulation is a flock of ducks with light feathers and dark feathers. The light feathered ducks are more easily spotted by the predator than the dark ducks. The duck or "quacker" population is represented by light and dark colored crackers.

MATERIALS
clean paper plate
light colored snack crackers
dark colored snack crackers

PROCEDURE
1. In this activity you will begin with a population that has equal numbers of light and dark "organisms" that will be fed on by you, the predator. As the predator, you prefer to eat the light organisms rather than the dark ones. Formulate a hypothesis regarding what will happen to the ratio of light to dark colored organisms if the predator more easily preys upon the light colored organisms. Record your hypothesis in the space provided on the student answer page.

2. The organisms in this activity will be ducks or "quackers" and will be represented by light and dark colored snack crackers. Obtain a pond (or bag) of quackers from your teacher. This bag will contain equal numbers of light and dark snack crackers.

3. Establish your generation 1 flock of quackers by having one partner reach in the bag, without looking, and randomly select 10 quackers (crackers).

4. Place the 10 quackers on a clean paper plate or napkin. Count how many light and how many dark quackers are present. Record your numbers for generation 1 on Data Table 1 of the student answer page.

5. Simulate predation by choosing three light feathered quackers from the flock of 10 and eating them. If you only have one or two light quackers, eat them first and then consume enough dark quackers to meet your quota. For example if you have only one light quacker, eat it and then two dark ones. If you have two light quackers, eat both of them and one dark one. But remember, as the predator, you prefer the light quackers.

6. To simulate reproduction in the population, close your eyes, reach into the bag, and choose three quackers to add to your plate. This should bring the total number of quackers back to 10.

7. Record the number of light and dark quackers that are now present in the flock in the space for generation 2 on Data Table 1.

8. The other partner should now take a turn at being a predator. The predator should eat three light quackers from the flock. If there are not three light quackers in the flock, follow the procedure described in step 5.

9. Simulate reproduction in the population by repeating step 6. Count the numbers of each type of quacker in the replenished flock and record the data in space for generation 3 on Data Table 1.

10. Repeat steps 8 and 9 two more times for a total of 5 generations of data.

11. As instructed by your teacher, combine your individual data with the class data for each of the five generations. Calculate the class average for each color quacker for each generation.

12. In the space provided on the student answer page, prepare a graph of the class averages of light and dark quackers for each generation. Be sure to include axes labels, units, and a title on your graph.

13. Answer the conclusion questions.

Name _____

Period _____

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HYPOTHESIS

DATA AND OBSERVATIONS

Data Table 1: Light and Dark Quackers Each Generation		
Generation	Light Quackers	Dark Quackers
1		
2		
3		
4		
5		

ANALYSIS

Data Table 2: Class Averages Light and Dark Quackers Each Generation		
Generation	Average Light Quackers	Average Dark Quackers
1		
2		
3		
4		
5		

Graph 1:

CONCLUSION QUESTIONS

1. Write a statement describing how the number of light and dark quackers changed over the period of 5 generations.

2. What do you predict would happen to the number of light quackers if you had continued predation for a total of 10 generations? Explain your prediction.

3. Which type of quacker would Darwin consider "most fit" in this predation situation, the light quacker or the dark quacker? Why?

4. What adaptation do these quackers possess that allows them to survive?

5. Explain why it is incorrect to say that an organism adapts to its environment.

6. What changes in the population would occur if the predation changed and began to prefer the dark quackers? Explain why these changes would occur.