

## **5<sup>TH</sup> GRADE**

### **NATURAL SELECTION SIMULATION**

**Summary:** Students simulate natural selection. Colored chips are placed on a colorful habitat and student predators gobble up a portion of the population. Survivors will be allowed to reproduce and a new generation formed. Overtime it should be seen that those colored chips best adapted or blended into their environment will survive and reproduce. This will change the initial population to a new population better adapted to its environment.

#### **Intended Learning Outcomes for 5<sup>th</sup> Grade:**

- 1a. Observe simple objects, patterns, and events and report their observations.
- 1d. Compare things, processes, and events.
- 3a. Know and explain science information specified for the grade level.
- 4a. Record data accurately when given the appropriate form.
- 4b. Describe or explain observations carefully and report with pictures, sentences, and models.
- 6c. Science findings are based upon evidence.

#### **Utah State Core Curriculum Tie:**

##### **Standard 5 Objective 2:**

- a. Compare the traits of similar species for physical abilities, instinctual behaviors, and specialized body structures that increase the survival of one species in a specific environment over another species.
- b. Identify that some environments give one species a survival advantage over another.
- c. Describe how a particular physical attribute may provide an advantage for survival in one environment but not in another.

**Preparation time:** 20 min once fabric and paper chips are prepared the first time

**Lesson time:** 1 hour

**Small group size:** works best with one adult for every 5 children

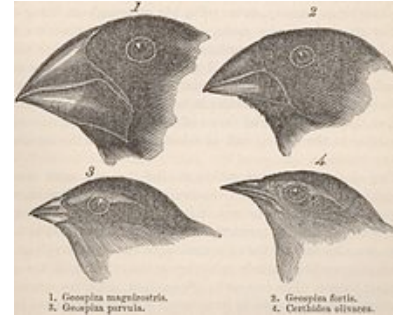
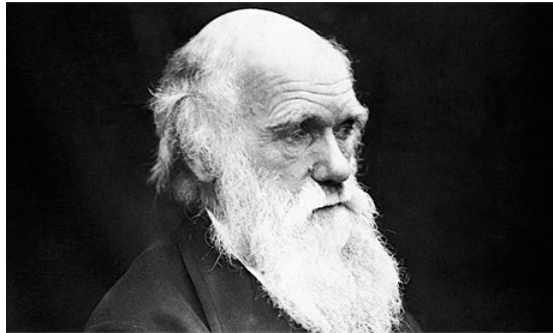
#### **Materials and preparation:**

1. A different 4' x 3' habitat for each group of 5 or 6 students. Purchase or find scraps of cotton material that are multicolored. Fabric with lots of differently colored flowers or other objects works best.
2. Use a hole punch to make colored paper chips from colored construction paper. Each group needs 5 different colors and about 75 paper chips per bag of each color.
3. Each group needs 1 habitat fabric and 5 different colors of paper chips. When you group the 5 colors per fabric make sure some of the colors blend in and some do not.
4. Student data sheet and questions.

#### **Background information:**

Charles Darwin proposed the theory of Natural Selection in the mid 1800's. He studied many animal and plant populations along the coast of South America. In his studies he summarized a list of observations.

- \* Offspring vary in their heritable characteristics.
- \* The offspring's environment will put pressure on the offspring. Those offspring best adapted to their environment will live and reproduce better than those that are not as well adapted to their environment. This is also called 'survival of the fittest'.
- \* Over time this causes a population to change and this change is called evolution.



Traits are passed down from parent to offspring through DNA. Sections of DNA that code for a particular trait are called genes. These genes can code for a variety of traits in the offspring. Genes that help an organism survive will allow the organism to reproduce and more offspring will carry the advantageous gene of the parents. Genes that hinder an organism's survival will reduce the ability of it to reproduce and then the gene will slowly become less prominent in the gene pool.

Darwin studied finches and observed that on each island the finch's food source was different. Over time, the finch population on each island changed and evolved towards successful adaptations to their food source. This occurred because the finches best adapted to their food source had their DNA more represented in the gene pool. In this lab, color and its ability to blend into an environment is the trait that will be followed through three generations. As the abundance of each color changes within the three generations their population of color chips will change over time. This change in a population over time is called evolution.

**Pre-lab discussion:** Show the students a picture of Charles Darwin and discuss his life and journey on *The Beagle*. Display pictures of his finches and explain that due to the different food sources on the islands the finches had adapted to having different beak sizes and shapes. Ask the students what would happen if a finch that had evolved to eating soft worms off the ground had suddenly landed on an island where the food source was hard seeds and nuts. Perhaps that finch wouldn't be able to survive and reproduce and then its DNA wouldn't reoccur in the gene pool. Discuss how variation drives changes in populations. Tell the students that today they are going to simulate a population changing over time due to the variation in the offspring. Don't give away too much about the lab or students will begin to make sure that the lab works 'correctly'.

### **Instructional procedure:**

1. Spread out the fabric on the tabletop. Have one student or the adult, write down the 5 color names across the top of the data table. There will be one data table per group.
2. Count out 20 chips of each of the 5 colors for a total of 100 as your initial population. These are the prey that will be 'eaten up' by the predators, which are the students. It helps to have one student in charge of each color throughout the experiment.
3. Appoint one person as the prey (chip) **distributor** for the first round. This person should spread the 100 chips out randomly over the entire fabric; make sure the chips do not stick together. This must be done randomly and not with the distributor trying to hide the prey on a certain color of the fabric. The other members of the group should have their backs turned during this procedure. This job can change during each predation.  
  
\*\* While student predators are waiting to 'eat', have them work on the "Structure and Function of Bird Beaks" worksheet.
4. The 3 **predators** (other members of the group) should turn around one at a time and pick off the prey (chips) until each student gets to 25. There should be 3 predators and each should pick up only 25 chips. **COUNT CAREFULLY**. Predators are to take the first chip they see and put that chip in their hands. They need to move quickly and pick up the first 25 they see over the whole fabric not just remaining in one area. Make sure they keep track of the number of chips they get. These chips that got eaten must be removed from the area, sorted and placed back in the correct bag. These are **not** your survivors.  
  
\*\* If 3 students pick up 25 chips each there should be 25 chips that remain on the fabric. These remaining chips on the fabric are your survivors.
5. Carefully shake off the fabric to remove **survivors** (remaining 25 chips).
6. Group the survivors according to color. Count and record these numbers on the data table.
7. Assume each survivor reproduces three new **offspring**. Using the reserve chips in the bag, count out three chips of the same color for each survivor. This should give you a final of 4x the initial amount of each survivor per color. For example, if you had 5 yellow left you should keep that 5 and add 15 more yellow for a total of 20 yellow. **You should be back at 100 for your population when the chips are done reproducing.**
8. Mix these chips together and re-distribute them as in step 3. Have the students switch jobs of distributor and predators.

9. Repeat the entire process one more time, making a total of three generations of prey being preyed upon. Remember each time you lay down the chips there should be a total of 100.

10. Answer the questions on the student answer sheet.