SCIENCE LESSON
NATURAL SELECTION

All species have variation of traits (characteristics). Just take a look around you and you will see that birds, for example, look very different from one another. Over time, certain physical characteristics will be selected and passed on to the next generation. Embark on a simulation to discover how it works.

FOR THE CLASSROOM
POSSIBLE APPROACH FOR THE CLASSROOM

LESSON LENGTH
50-60 MINUTES

OBJECTIVE
LEARN ABOUT GENETIC VARIATION & NATURAL SELECTION

MATERIALS
SEE BELOW

VOCABULARY:

- Genes
- Genetic Variation
- Traits
- Mutation

- Heredity
- Natural Selection
- Adaptation
- Extinct

- Survive
- Evolve
- Forage

MATERIALS

Powerpoint, Worksheet, Computer, Internet, Toothpicks, Plastic Spoons, Plastic Forks, Plastic Knives, Choptsticks, Large Beans (ex. Kindney or Lima), Medium Beans (ex. Black beans, Pinto beans), Mini Marshmallows, Tray or Paper Plate, Cup, Timer

PROCEDURE

1. Download and teach the NATURAL SELECTION SLIDE DECK. Feel free to customize it to suit your teaching needs.

2. Student Activity 1: Have your students complete the NATURAL SELECTION WORKSHEET and follow the steps below.

a. Pre-Prep: Set up one tray/paper plate for each group with the following items. 20 small beans, 15 large beans and 15 mini marshmallows

b. Put your students in groups of 4 and pass out one cup and one of the following utensils to each student. Plastic Fork, Plastic Spoon, Plastic knife and Toothpick/chopsticks. Each student in the group should have a different utensil.

c. Explain to your students that they are birds from the same species that have slightly different beaks. The utensil each student uses represents their beak variation.

d. Go over the following rules of the activity with the classroom.

> Rules: You have one minute to pick up as much food (beans & marshmallows) off the tray/plate as you can with your utensil. One hand can hold the utensil, and the other hand must go behind your back. Use the utensil to collect food (beans & marshmallow) by moving food from the plate into your cup. You cannot pick up your cup during the active simulation. If you get caught breaking a rule, you will become "extinct"!

LESSON PLAN CONTINUED

NATURAL SELECTION

PROCEDURE

Student Activity 1 (Continued)

Round #1

a.   Set a timer for one minute. Tell students to begin the simulation.

b.   When the minute is up, tell your students to freeze and put their utensils down. Then, have them to count the items of food in their cup and record the results on their worksheet.

c.   Have the students who collected the most amount of food, in each group, hold up their utensils. Tell them, "Congratulations, you survived the year and you are the birds that will have offspring! You and your offspring will move on to the next round."

d.   Have the students with the least amount of food hold up their utensils. Tell them "Unfortunately you did not get enough food to survive this year. You will not move on to the next round" Take away their utensil and replace it with the type of utensil that got the most amount of food. Tell them they are now the offspring of the utensil that collected the most food.

Round #2

a.   Students will reset the food on the plate and repeat steps a-d in Round #1.

Round #3

a.   Students will reset the food on the plate and repeat steps a-d in Round #1.

b.   Discuss the results. Which traits are left and why? Explain that this is how natural selection works. Evolution of anatomical features is a result of natural selection. What behaviors did the students notice while foraging? Competition for food is a real struggle for animals in all environments.

BACKGROUND INFORMATION

NATURAL SELECTION

Charles Darwin's theory of Natural selection can be described with 4 points.

•   There is variation in traits or genetic variation.

•   The individuals best adapted to an environment are most likely to produce offspring.

•   There is heredity.

•   The end result is evolution. The more advantageous a trait, the more common it will become in the population. These advantageous traits are called adaptations.

Let's look at a simple example of natural selection. In a population of tree frogs there are grey tree frogs and green tree frogs. Tree frogs are often eaten by predatory snakes and birds. A green tree frog on the bark of a tree is easier to find than green tree frog on a leaf. So, green tree frogs that go into habitats where they are not camouflaged are more likely to be eaten by predators. And in these habitats, they don't live to make baby green tree frogs. Due to this, in habitats that are more wooded, we see more grey tree frogs. In areas that are marshier and swampier, there are more green tree frogs. The color of the tree frog is an adaptation guided by the type of habitat the frog lives in.

LESSON PLAN CONTINUED
NATURAL SELECTION

BACKGROUND INFORMATION CONTINUED

GENETIC VARIATION

Variation of traits exists in populations. Gene are the part of your DNA that express traits., hence the name genetic variation. Individuals within a species have similar but not identical genes. These variations are helpful when environments change. Variation of traits give organisms a better chance of survival.

One reason variations of traits exist is genetic mutations. Mutations are random changes in an organisms DNA that can be beneficial, neutral or harmful.

HEREDITY

Heredity is the passing of traits from parent to offspring. Traits get passed on from one generation to the next. Each offspring is a combination of genes from its two parents.

BIOLOGICAL EVOLUTION

Evolution is a gradual change in the characteristics of a population of animals or plants over successive generations. All living things that exist today come from earlier types. The differences between them are a result of changes that happen over many years. The simplest forms of life began 3.5 billion years ago and over time they evolved into the millions of species living today.

Fossils, common traits and species changing over time give us evidence that evolution has occurred. Fossils show us that organisms who lived long ago are different than the organisms that live today. Through looking at fossils we see common traits that help organisms survive, are passed on to the next generation. Observations of populations and organisms in the wild and in a laboratory reveal that species are changing. For example, the Tawny Owls of Finland, who normally come in grey and brown, have seen a shift in their coloration. In the past, cold white winters have favored the grey colored owls. The grey coloration helped them hide from predators in the snow. But, as winters have become milder in the last 50 years, scientists have noticed the grey owls are in decline, and the brown birds are thriving.

LESSON PLAN CONTINUED
NATURAL SELECTION

NEXT GENERATION SCIENCE STANDARDS

MS-LS4-4 Biological Evolution: Unity & Diversity

- Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

- LS4.B Natural Selection: Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

- Cause and Effect: Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

MS-LS4-6

- Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.]

- LS4.C: Adaptation: Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.

SCIENCE LESSON WORKSHEET

NATURAL SELECTION

Natural Selection is the theory that organisms with favorable traits will survive and produce offspring. Over time, populations of organisms will end up with specific traits that help them survive.

VOCABULARY

- Traits: The characteristics that genes express. Like, hair color, eye color or height etc..
- Heredity: The passing of traits from parent to offspring.
- Genes: Are a part of DNA that controls the development of an individuals traits.
- Genetic Variation: Individuals with in a species have different genes.
- Mutation: A random alteration in an organisms DNA. This can sometimes result in a completely new trait like better vision (triachromatic vision).
- Natural Selection: Theory by Charles Darwin where organisms with traits that help them survive are more likely to reproduce.
- Adaptation: A special characteristic that enables an organism to be successful in a particular environment.
- Extinct: To no longer exist. For a species, to no longer have any members of that species alive.
- Survive: To exist.
- Evolve: To change into something else.
- Forage: To search for food.

NATURAL SELECTION SIMULATION

You are all birds from the same species with slightly different beakes (plastic fork, plastic spoon, plastic knife, or toothpick/chopsticks). Your goal is to pick up as much food (beans & marshmallows) off the tray/ plate as you can, in one minute, with your utensil.

RULES:

- One hand can hold the utensil, and the other hand must go behind your back.
- Use the utensil to collect food (beans & marshmallow) by moving food from the plate into your cup.
- You cannot pick up your cup during the active simulation.
- If you get caught breaking a rule, you will become extinct.
- Record data and observations for each round on pages 2-3 of worskeet.

NATURAL SELECTION GAME CONTINUED

ROUND #1
What utensil were you? How easy or difficult was it to use? Explain.

_____

_____

_____

How many pieces of
food did you collect?

_____

TYPE OF UTENSIL	# OF PIECES OF FOOD

Did your utensil move on to the next round? Why or why not?

_____

_____

_____

ROUND #2
What utensil were you? How easy or difficult was it to use? Explain.

_____

_____

_____

How many pieces of
food did you collect?

_____

TYPE OF UTENSIL	# OF PIECES OF FOOD

Did your utensil move on to the next round? Why or why not?

_____

_____

_____

NATURAL SELECTION GAME CONTINUED

ROUND #3
What utensil were you? How easy or difficult was it to use? Explain.

_____

_____

_____

How many pieces of
food did you collect?

_____

TYPE OF UTENSIL	# OF PIECES OF FOOD

Did your type of beak move on to the next round? Why or why not?

_____

_____

_____

Evolution is the change in the characteristics of a species over generations.
How did the entire group's beak characteristics change after 3 generations? How? Explain

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