

Budding Biologists

*Note: There are two versions of this presentation: the one entitled “Forensic Investigation” is for if the materials are available to perform an electrophoresis experiment, or to show a Youtube video which covers the experiment; the one entitled “Forensic Investigation – Computers” is an option for if the materials for electrophoresis are not available and instead a class set of computers can be used for a virtual experiment.

Materials:

- Bottled water
- Clear dish soap
- Food dye (blue was good for contrast)
- Table salt
- Isopropyl alcohol
- Stir sticks (wooden were fine)
- Small rectangular plastic box
- Stainless steel wire (24-18 gauge) and wire cutters if need be.
- 5 – 9 Volt batteries
- 2 – Alligator clip leads
- Styrofoam tray or flat piece
- Measuring spoons
- Baking soda
- Agarose powder (available online or at chemical retailers on-campus)
- Microwave
- Food colouring dyes (3 colours)
- Graduated cylinder or other measuring utensil

Introduction:

1. What do scientists do?
2. Where do you find scientists?
3. What is a scientist? What is a biologist?
4. How does this type of science affect your life? What about other types?

What is Biology?

1. Biology is the study of living things

2. How can we tell if something is “living”? *List of characteristics is provided; may have to elaborate on some of them...ie: that trees and coral aren't moving around, but they do move as they grow and are still considered living.*
3. Have students identify the living things in the pictures. *Corn stalks, monarch butterfly, great white shark, trees.*
4. Before changing the slide, have students guess what three things living things need to survive: **food, water, shelter**. *Some students may mention air, but remind them that not all animals breathe the same way. For example, plants take in carbon dioxide instead of oxygen. These three options cover the most basic factors that are common to all living things.*

Hungry Birds!

1. This is an activity intended to get students up and moving. You'll need some room for students to move around.
 - a. Count students off from 1 to 4.
 - b. 1's: birds; 2's: food; 3's: water; 4's: shelter.
 - c. Movements:
 - i. Food: hands on tummy
 - ii. Water: hands on mouth
 - iii. Shelter: hands above head like the roof of a house
 - d. Have students practice the movements while leading them. For a bit of fun, try to trick them by doing the wrong motion for one of the resources.
 - e. Line the birds up on one side of the classroom, and the resources on the other. Have the birds face away from the resources, ideally towards a volunteer so they can explain what they are going to do while another volunteer works with the resources.
 - f. Have the birds think about what **one** resource they want, and have the resources do the motion according to the number they were given. Have the birds spin around on the count of three and go retrieve someone making the sign of the resource they want, bringing them over to the bird side. *Try to discourage running.*
 - g. Draw the students' attention to the change in the amount of resources and birds. Which increased? Which decreased?
 - h. Continue with the same directions until there aren't enough resources left to satisfy the birds. Take any birds who didn't get resources during this round aside, emphasizing that they have not lost the game, they are just going to be involved in a special twist (this is really important if you are working in younger grades or a special needs classroom).

- i. Split the birds who successfully obtained resources so that half of them remain birds and half return to the resource side for the next round.
 - j. The birds who had no resources are now **predators**, which means they will go after birds in the next round. Discuss with the students what it means to be a predator, and let them pick out which predator they want to be (tigers and dinosaurs were remarkably popular). Line up the predators between the two lines of birds and resources so that they may intercept the birds on the next round.
 - k. Play the round as usual, instructing the predators to only intercept the birds who are en route to getting a resource. The birds who have obtained a resource are considered safe.
 - l. After a round or two, discuss how the populations of predators, birds, and resources have changed.
2. Once students have returned to their seats, do a quick recap of the 3 things the birds needed to survive (*food, water, shelter*).
 - a. Ask what caused the number of birds to grow at the start of the game (*the availability of resources*), and what caused them to die later on (*less resources available, then the presence of predators*).
 - b. Why is it important to know what affects populations? *It's good to know what affects populations to keep our food chains healthy and prevent endangering or extinction of living things.*
3. What are the different parts of a bird?
 - a. Go through the different parts of the diagram, inviting students to read aloud with you.
4. What do birds use to eat?
 - a. As a “funny” question, ask students why birds don't use knives, forks, or spoons to eat? *Because they have beaks!*
 - b. To segue into a discussion on insects, ask what birds eat. *Seeds, berries, **insects!***

Insect or Not and Insect

1. Hand out the laminated clipart image cards containing a variety of insects and non-insects, ideally one to each student.
 - a. Have students get up and either join an “insect” line or “non-insect” line on either end of the classroom.
 - b. Go through each student's card one by one and have them try to name the creature on it. Be supportive and give them hints or have the students help one another if need be.

- c. Don't let students change sides right away if they think their guess or insect or not was incorrect.
2. Ask students to describe an insect, and present the slide of a fly to compare to.
 - a. Tell students that if they have at least 2 of the characteristics presented, they likely have an insect card! *3 body segments, 6 legs, antennae, 1 or 2 pairs of wings.*
 - b. Let students regroup at this point after learning what it actually means to be an insect. Offer supportive guidance so students don't feel foolish or ousted in front of their peers.
 - c. Have students hand in their cards before sitting back down.

Parts of an Insect

1. Introduce the 3 different parts of an insect: **head, thorax, abdomen**. Compare to a human body if you feel comfortable.
2. Outline the more specific parts of the insects with the whole class as you point.

How are Birds and Insects Interconnected?

1. *Birds feed on insects!*
2. What do we call it when living things feed off of one another? *Part of a food chain!*

What is an Ecosystem?

1. What are the different levels in an ecosystem?
 - a. For younger classes, introduce these levels as **plants, herbivores, and carnivores**.
 - b. For strong classes, introduce the food chain levels as **producers, primary/secondary/tertiary/quaternary consumers**.
 - c. Ask students if the water and land-based food chains are independent? Can they think of a living thing that could exist in both chains? *A bear, a frog, etc.*
2. Why is it important to have birds and insects in the ecosystem? *If they weren't present, other living things would flourish or die, creating an imbalance. Ask what would happen if the mouse was removed from the food chain. An overabundance of grasshoppers and a pressured situation for the snakes.*

Ecosystem Tumble

1. Divide the students into groups of plants, herbivores, and carnivores. Have there be more plants than either other group.

2. Hand out the cardstock with 4 lines on it, and have students draw or write the name of a plant/animal that the student chooses, as long as it falls within their assigned category.
3. Circulate and help students fold along the four lines and tape the cardstock into a rectangular prism.
4. Explain to students that you will be playing a game similar to Jenga, and have the plants come up to the front to form the base of the tower. Put the blocks in groups of three, forming a criss-cross pattern as it rises, just like in Jenga. Call up the herbivores, then the carnivores, to finish the tower so it is similar to an ecosystem food chain.
5. One by one, have students come up and try to pull out a living thing from the tower. They will then place that block on top and continue to make it grow. Discuss what happens as more living things are pulled out of the ecosystem. *It becomes unsteady.*
6. If the tower falls, rebuild it again and assure students that it will fall several times. If pressed for time, take half the blocks and build two towers so students will get to play sooner. After everyone has had a turn, give the students their blocks back. (You may want to wait until the end of the presentation, and be sure to ask the teacher if they mind).
7. How do you compare this activity to what happens in different, actual ecosystems? *Living things don't usually go extinct right away; there is a process and different classifications as they become increasingly endangered. If an animal really was removed from an ecosystem, the other members will flourish or have to adapt to the difference.*

Source:

“Gel Electrophoresis and Forensic Science: Biotechnology Science Fair Project”:
<<https://www.youtube.com/watch?v=QWkfXjGohVk>>