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AUDUBON



Curriculum Set: Climate Initiative

Young Ambassadors for Birds in the Face of Climate Change

Lesson 3: The Carbon Cycle

Goal: Students learn the basics of carbon cycling, and play a game to demonstrate molecular interactions.

Science

Adaptable for Grades 4-8

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Total lesson time: 1 hour

Lesson: 30 minutes

Group Activity: 30 minutes

Materials needed:

Presentation on Climate Initiative Lesson 3

Molecule necklaces

Something to represent an animal or a plant (towel, hula hoop, rug, etc.)

Lesson


Tips:

- While playing the molecule game, have one group of kids demonstrate the molecular pathway. Walk them through it, and have the rest of the class watch. Then have the rest of the students form groups to practice it themselves. Walk around the room to make sure that everyone is flowing through the pathway correctly. Finally, ask groups to demonstrate this in front of the rest of the class.
 - Several repetitions were often required before students were able to flow through the pathway themselves.
 - Challenge the students by asking them to go through the pathway backwards (if you were flowing from plant to animal, try animal to plant).

Outline

The Scientific Method

1. Ask the class if they remember what the scientific method is.
 - a. Quickly review the scientific method
 - i. Ask a question: look at the world around you for inspiration. What would you like to know more about?
 - ii. Make a hypothesis: this is a possible answer to your question, kind of like an educated guess. You should be able to say that it is true or false (accept or reject it) at the end of your experiment.
 - iii. Collect data: go collect data that will help answer your question. Be sure to discuss the importance of unbiased data with older kids.
 - iv. Draw conclusions: Look at your data. Does it support or contradict your hypothesis?
 - v. Share your results: spread the word! Scientists do this by writing papers, making posters, and giving presentations.
2. Ask the class if they remember what “phenology” is.

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- a. Phenology: the natural progression of events as they happen throughout the seasons.
 - b. Remind them that everything on the Earth is connected.
 3. So far, we have talked about big changes that are happening to our Wisconsin habitat, and how it will affect our birds. Today, we're going to start learning about the specifics of climate change.
 4. We're going to start by learning about the carbon cycle. It also helps to connect everything on the Earth.
 5. Ask the class if they like ice cream
 - a. Imperfect analogy created by the Jefferson Lab (education.jlab.org):
 - i. Imagine you are going to an ice cream shop. They have 30 different flavors of ice cream. These are the elements, and the things we can all build our desserts from.
 - ii. The smallest amount of ice cream that the store will sell to us is a scoop.
 - iii. A scoop of ice cream represents an atom
 1. Carbon and Oxygen are both types of atoms.
 - iv. If we want, we can put two or more scoops of ice cream together.
 1. This becomes a molecule.
 2. Carbon Dioxide is a type of molecule.
 - v. This analogy is imperfect because:
 1. Splitting an atom creates different elements.
 2. We would need the scoop of ice cream to change flavors when it was cut in half for the analogy to work correctly.
 3. *no need to tell the kids this, unless of course, they ask*
 - b. Another way to explain it is that the atoms are also a little like legos. They can be put together to make something bigger, or pulled apart and rearranged.
 - i. Explain that when you put two Oxygen atoms and one Carbon atom together, you build a Carbon Dioxide (CO₂) molecule.
 - ii. If you put two Oxygen atoms together, you build an Oxygen (O₂) molecule.
 - c. Ask the students if they know where we could find CO₂ or O₂, and why they are important.
 - i. In the air- they are gasses.
 - ii. We breathe in O₂ and breathe out CO₂
 - iii. Most living things need O₂ or CO₂ to survive!
 - d. Introduce the Carbon Cycle
 - i. Animals: O₂ in, CO₂ out
 - ii. Plants: CO₂ in, O₂ out
 6. Carbon isn't just in the air around us. All life on Earth is made up of Carbon.
 - a. It is in trees, in grass, in birds, in insects, in tiny microorganisms, in frogs. Carbon is the building block that is a part of every living thing.

7. Ask if any of the students have ever left the lunch box under their bed with food in it, or found something that has been in the fridge too long.
 - a. Food starts to break down, and decompose. (organisms like molds and fungus help break things down faster).
 - b. This happens to all living things when they die.
 - c. The Carbon returns to the earth, so that nothing is wasted.
8. Carbon is found in
 - a. The air
 - b. All life
 - c. The soil
9. Long ago, Carbon from all of the animals that died (the dinosaurs!), got covered with sand and silt and soil. Millions of years passed, and compressed the carbon.
 - a. Coal, gas, and oil were produced.
 - b. This process takes a VERY long time.
 - c. Animals that die today will eventually become coal, gas, and oil- but it will take such a long time that we won't be able to use it.
10. People burn coal, oil, and natural gas for fuel.
 - a. We heat our homes.
 - b. We drive cars, boats, and planes.
 - c. We use other big machinery.
11. When we burn these things, we break down molecules.
 - a. We produce heat, water, and CO₂.
12. Spend a while on the complicated carbon cycle diagram:
 - a. Explain it once yourself
 - b. Have a student (or several students) explain it for the class
 - c. Plants and animals are living things, made up of carbon. The animals breathe in oxygen, and breathe out carbon dioxide. The plants take in carbon dioxide, and produce oxygen. These gasses go into the air around us.
 - d. When living things die, they begin to break down. The carbon goes back into the soil, and after many years it forms oil, coal, and natural gas.
 - e. People burn the oil, coal, and natural gas to power our world. This puts more CO₂ into the atmosphere.
13. Summary slides
14. Introduce molecule activity.