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Curriculum Set: Climate Initiative

Young Ambassadors for Birds in the Face of Climate Change

Lesson 4: The Greenhouse Effect

Goal: Students learn the basics of the greenhouse effect

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 4

Lesson


Tips:


- Spend enough time reviewing the Carbon Cycle lesson material at the beginning of this lesson before proceeding to the new lesson.
 - Especially on the Carbon Cycle diagram. Have several students explain the cycle to the rest of the class.

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. Make 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.
 - 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. We talked about Carbon Cycle and the specifics of climate change. Now today we will talk about the greenhouse effect.
4. *****CARBON CYCLE REVIEW*****
5. The Carbon Cycle also helps to connect everything on the Earth.
6. Ask the class if they like ice cream

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- a. Imperfect analogy created by the Jefferson Lab (education.jlab.org):
 - b. Atoms are like scoops or ice cream or legos: they can be put together to form something bigger (A molecule) and pulled apart again.
 - 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. Review the Carbon Cycle
 - i. Animals: O₂ in, CO₂ out
 - ii. Plants: CO₂ in, O₂ out
 - e. All life is made of carbon, and when living things decompose, the carbon goes back to the earth.
 - f. Review the carbon cycle diagram
7. Before we dig into the greenhouse effect, let's talk about the difference between *weather* and *climate*. Ask the class if they have ideas about what makes them different.
- a. Review the definitions and the examples.
 - b. If your class is unfamiliar with what averages are, explain this. You can talk about it mathematically, or what the term means more generally.
 - i. A good example is asking students when they get up in the morning. If they say "around 6 a.m." they are giving you an average time (climate). If they answer describing the specific time they get up each day of the week, that is not an average (weather).
 - c. Many young students think of an event as something to go to like a birthday party. Explain that an event is just something that happens. It can be a tree falling over, or a loud noise. Or weather events!
 - d. Go through the climate or weather quiz, and make sure students understand the answers.
8. Ask students if they know what a greenhouse does.
- a. Sunlight is able to pass through the glass or plastic of a greenhouse. Energy from the sun heats up the air and plants inside the greenhouse.
 - b. If the greenhouse is a closed environment, with no holes or vents, heat is not able to leave. Many greenhouses have vents, which allows some heat to leave. This keeps the inside of the greenhouse from getting too hot for plants to live.
 - i. This is the same way a car warms up if the windows are rolled up.
9. Apply this to the Earth.

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- a. The Earth is surrounded by our atmosphere. This is made up of gasses that act like a greenhouse keeping the earth warm.
 - i. Atmosphere diagram: discuss the fact that there are layers to the atmosphere, and different things happen in each one:
 1. The troposphere is closest to earth, it is where weather happens
 2. The stratosphere is the next layer, it is where airplanes fly.
 - b. The greenhouse effect
 - i. The greenhouse gasses act like the glass in a greenhouse. The sun's energy can pass through it, which heats up the atmosphere and the earth. The atmosphere also allows some of the heat to escape back into outer space. This is like the vents on the greenhouse.
 1. Discuss what all of the arrows mean: sunlight/energy passes through the atmosphere and hit the earth. Some bounces back into space, leaving the earth. Some is kept in by the atmosphere, and keeps the earth warm.
 - ii. This is a GOOD thing! If we didn't have our atmosphere, the Earth would be too cold for anything to live on it.
10. Humans are burning lots of fossil fuels.
- a. What does this do? Releases greenhouse gasses into the atmosphere.
 - b. This changes the types of gasses in our atmosphere, and helps it to hold in even MORE heat.
 - i. Much less heat is able to escape into space.
 - ii. Because of this extra heat, our earth is becoming warmer than it should be.
 - c. In 150 years, the Earth will be 1.6 degrees warmer.
 - i. This may not seem like a lot, but think about the last time you were sick with a fever. Even though your temperature only rose one or two degrees, you felt really awful. Maybe you needed to lay down all day, or you didn't feel like eating- a few degrees makes a difference!
11. What can we do to help ?
- a. Try to put fewer greenhouse gasses into the air by reducing our fossil fuel use.
 - i. Go through the examples.