



“Sea” the Change

Grade Level

Grade 4

Objective

This activity is designed to help your at-home student recognize themselves as scientists and think critically about problem-solving. The goal is to help your student practice critical thinking skills. As with all lessons provided, please feel free to adapt them according to your students’ abilities. Take these ideas, make them your own and your at-home students will have a greater chance at success.

Materials

Paper, writing utensil, crayons, thermometer (if available), drinking glass, measuring cup that can measure 1 cup, hot water, timer, aluminum foil, newspaper, tape.

Background

When we breathe in air, we absorb the oxygen we need, and then we breathe out carbon dioxide, or CO₂. Plants use this CO₂ for photosynthesis, so regular amounts of CO₂ are found in a healthy, natural environment and are important for organisms like plants for development. However, humans also adding CO₂ to the air when we burn fossil fuels for energy, like when we run our cars or power our homes. We call this rampant CO₂ because there’s way too much of it and its getting out of control. The plants cannot absorb all of this excess CO₂ so another place it gets absorbed is up in the Earth’s atmosphere. A lot of this rampant CO₂ is building up in the atmosphere, and because the atmosphere is like a blanket that surrounds the Earth, the more CO₂ we add to it, the thicker the blanket gets, and the more heat it traps underneath. This heat-trapping blanket is making the planet warmer and its disrupting the climate.

Earth’s ecosystems are affected by climate change. Climate is the average weather conditions of a place over the course of several decades. It is different from weather because weather is the day-to-day conditions. Weather can change greatly from day-to-day, whereas climate remains stable on a yearly/seasonal basis. Climate change is when those average conditions shift to new patterns or conditions.

The experiment that you will conduct as a part of this activity will demonstrate how carbon dioxide warms the planet.

Procedures

1. Take a drinking glass and fill it with one cup of hot water from the faucet. Ideally the water should be around 105-110 degrees F (around the temperature of a hot shower).
 2. Place the thermometer in the water. Hold it so that the tip of the thermometer is in the middle of the water glass. It should not be touching the bottom or the sides of the glass. If no thermometer is available, you can simply use your finger to make an observation of the temperature.
 3. Record the temperature (or your observation based on using your finger) on a sheet of paper or in the worksheet at the end of this lesson plan.
 4. Wait ten minutes. As you are waiting, think about what might happen to the water. Do you think the temperature will change? If so, what are your predictions? Record them on your sheet.
 5. After ten minutes, take the temperature of the water again. Subtract the second temperature from the first temperature. What is the difference? How much did it cool off? If you used your finger, what did you observe?
 6. Empty the water glass. Wrap the glass in several layers of newspaper. Make sure you use at least three or four layers. One layer will not give you a large difference. If you have bubble wrap, packaging foam, a thick blanket, or some other type of insulation, you may use that instead. Make sure that you do not forget to wrap the bottom of the glass in insulation. You can use tape to help keep the insulation in place.
 7. Wrap the insulated glass in aluminum foil. Put some aluminum foil to the side. You will use it to cover the top of the glass after you take the initial temperature of the water.
 8. Fill the glass with one cup of hot water. Take the temperature and record it on the worksheet. Cover the glass with the aluminum foil.
 9. Wait ten minutes. As you wait, think about what the temperature might do. Will it be the same as the first trial? Why or why not? Record your predictions on your sheet.
 10. After ten minutes have passed, remove the foil from the top of the glass and take the temperature of the water.
 11. Record the temperature and subtract it from the initial temperature.
 12. Compare the temperature differences between the two glasses. What did you observe?
 - a. Which glass lost the most heat and why do you think so?
 - b. What would have happened if you added more insulation?
 - c. How is the aluminum foil and insulation like carbon dioxide in the atmosphere?
- ❖ Changing temperatures, due to climate change, can have a lot of effects on ecosystems around the world. Ecosystems are made of biotic (living) and abiotic (non-living) components. The climate is a very important abiotic component of an ecosystem. In some cases, climate defines the ecosystem. For instance, a desert is defined by the amount of precipitation it receives. Deserts are very dry because they get very little rain or snow. If the climate were to change, and it

started raining more often, it would affect the plants and animals living there, as they have adapted to living in a dry climate.

- ❖ Ocean ecosystems are affected by climate change too. Think back to the water temperature experiment you just did. The water in the glass represents ocean water. The glass without the insulation is like the ocean with no climate change. Heat is able to escape. The glass with the insulation is like an ocean affected by climate change. Heat is not able to escape. Oceans absorb heat from the atmosphere which increases the temperature of the water.
- ❖ Think about how a warming ocean might affect the organisms that live there. Some fish like very particular temperatures. What will happen to the fish if the water gets too warm? Since fish are a part of the food chain, what might happen to other organisms, like sea lions that eat fish, in that food chain?

13. Select an organism that lives in the ocean and is affected by climate change. Write a story/poem or create a poster that shows how their changing environment affects their survival.

Optional Extension

14. Think about some ways you and your family can reduce home carbon emissions to help minimize their contribution to climate change.
15. Write down a plan and discuss it with your family. Some ideas include:
- a. Power down and unplug infrequently used electronics. Reduce your screen time and energy consumption.
 - b. Use public transportation, carpool, bike or walk when possible to reduce carbon emissions from vehicles.
 - c. Plant your own vegetable and/or herb garden. It's great to know where your food comes from, and it will lower your carbon footprint by saving the process of transport and packaging of items you would purchase at the store.
 - d. If having your own garden isn't possible, shop at a local farmers market for produce instead of a grocery store to reduce your carbon footprint and support the local economy.
 - e. Use your political power: contact your local representatives to advocate for environmental action and sustainable policies.

Standards

Ohio Academic Content Standards
Grade 4 Life Science Topic: Earth's Living History Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.



Insulation Investigation

Glass 1 with no insulation	
Starting temperature or observation (0 minutes)	
Ending temperature or observation (10 minutes)	
Temperature change or observation (starting temp minus ending temp)	

Glass 2 with insulation	
Starting temperature or observation (0 minutes)	
Ending temperature or observation (10 minutes)	
Temperature change or observation (starting temp minus ending temp)	

Compare the temperature change between Glass 1 and Glass 2. Which glass had the greatest change in temperature?

What does this tell you about the role of insulation?

How is this like excess carbon dioxide in the atmosphere?