

Climate Heroes Lesson Plan

The Carbon Cycle and its Role in Climate Change

Activity 3

Grades 8-10

Time required: 1–2 class periods

Focus Question

- How does carbon move through the carbon cycle?

Learning Objective

- Students will learn about the natural process of the carbon cycle and human's impact on this cycle

Materials

- Teachers will need to make cards for each station and a record sheet for students to record their journey as they move through the cycle (see attached).

Procedures

1. Briefly give students an overview of the carbon cycle. This can be done by presenting it as a diagram and explaining how carbon moves from place to place on the Earth.
2. Set up stations, one for each location in the carbon cycle (atmosphere, plants, animals, soil/Earth, ocean, decomposers).
 - At each station have a series of cards that explain how the carbon moves from that station. For example:
 - Plants—You were eaten by a rabbit, go to animal or you were released to the atmosphere when the plant respired at night, go to atmosphere.
 - Atmosphere—You were absorbed by a plant during photosynthesis and made into sugar, go to plant. You were lifted to the upper atmosphere, stay at atmosphere.
3. Explain to students that they will be a “carbon atom” and as they move from station to station (when a signal is given) they will be moving through parts of the carbon cycle. Have students record their journey as they move through several rounds of the game.
4. After several (7–10) rounds of the game have student discuss their journeys. Ask the students to note that all journeys are different in the carbon cycle and there are certain places that hold the carbon.
5. Once the students seem comfortable with the cycle have the students think of ways that humans have impacted this cycle. You may want to have them try to recreate the game with stations and card changes that show how humans have impacted this cycle. Then, play the game and see how it changes the journey.

Assessment

You may want to have students write a story explaining the journey they made as a carbon atom. This can be used to assess their understanding of the cycle.

Activity cards

Industry and Vehicles Cards

You are carbon in the form of coal (fossil fuels). You are burned in a power plant. You now go to the Atmosphere pool as CO ₂ . Beginning form: fossil fuels Process: combustion End form: CO ₂	You are carbon in the form of gasoline (fossil fuels). You are burned in a car. You now go to the Atmosphere pool as CO ₂ . Beginning form: fossil fuels Process: combustion End form: CO ₂
You are carbon in the form of coal (fossil fuels). You are burned in a power plant. You now go to the atmosphere pool as CO ₂ . Beginning form: fossil fuels Process: combustion End form: CO ₂	You are carbon in the form of gasoline (fossil fuels). You are burned in a car. You now go to the atmosphere pool as CO ₂ . Beginning form: fossil fuels Process: combustion End form: CO ₂

Animal cards

You are carbon in the form of sugar and you go through respiration to provide the animal with energy. Go to the atmosphere as CO ₂ . Beginning form: carbohydrate Process: respiration End form: CO ₂	You are carbon that was unable to be digested by the animal. Go to the litter and waste pool. Beginning form: organic matter Process: none End form: organic matter
You are carbon that has become part of the body of the animal. Beginning form: organic matter Process: storage End form: organic matter	You are carbon in the body of the animal and you die. Go to the litter and waste pool. Beginning form: organic matter Process: storage End form: organic matter

Atmosphere cards

<p>You are carbon in the form of CO₂. You are taken up by the plant for photosynthesis. Go to the vegetation pool.</p> <p>Beginning form: CO₂</p> <p>Process: photosynthesis</p> <p>End Form: carbohydrate</p>	<p>You are carbon in the form of CO₂. You stay in the atmosphere.</p> <p>Beginning form: CO₂</p> <p>Process: none</p> <p>End Form: CO₂</p>
<p>You are carbon in the form of CO₂, and you enter the ocean. Go to the ocean pool.</p> <p>Beginning form: CO₂</p> <p>Process: chemical form change</p> <p>End form: bicarbonate</p>	<p>You are carbon in the form of CO₂. You are taken up by the plant for photosynthesis. Go to the vegetation pool.</p> <p>Beginning form: CO₂</p> <p>Process: photosynthesis</p> <p>End form: carbohydrate</p>
<p>You are carbon in the form of CO₂. You stay in the atmosphere.</p> <p>Beginning form: CO₂</p> <p>Process: none</p> <p>End form: CO₂</p>	<p>You are carbon in the form of CO₂, and you enter the ocean. Go to the ocean pool.</p> <p>Beginning form: CO₂</p> <p>Process: chemical form change</p> <p>End form: bicarbonate</p>

Bacteria and Fungi (Decomposers) cards

<p>You are carbon that has been used by the bacteria and fungi for energy through respiration. Go to the atmosphere pool as CO₂.</p> <p>Beginning form: carbohydrate</p> <p>Process: respiration</p> <p>End form: CO₂</p>	<p>You are carbon in the body of the bacteria and fungi. You continue to grow. You remain in the bacteria and fungi pool.</p> <p>Beginning form: organic matter</p> <p>Process: growth</p> <p>End form: organic matter</p>
<p>You are carbon in the body of the bacteria and fungi. You die and go to the litter and waste pool.</p> <p>Beginning form: organic matter</p> <p>Process: death</p> <p>End form: organic matter</p>	<p>You are carbon that has been used by the bacteria and fungi for energy through respiration. Go to the atmosphere pool as CO₂.</p> <p>Beginning form: carbohydrate</p> <p>Process: respiration</p> <p>End form: CO₂</p>
<p>You are carbon in the body of the bacteria and fungi. You continue to grow. You remain in the bacteria and fungi pool.</p> <p>Beginning form: organic matter</p> <p>Process: growth</p> <p>End form: organic matter</p>	<p>You are carbon in the body of the bacteria and fungi. You die and go to the litter and waste pool.</p> <p>Beginning form: organic matter</p> <p>Process: death</p> <p>End form: organic matter</p>

Fossil Fuel Cards

<p>You are carbon in the form of fossil fuels. It is many years until you are discovered.</p> <p>Beginning form: fossil fuels</p> <p>Process: storage</p> <p>End form: fossil fuels</p>	<p>You are carbon in the form of fossil fuels. You are discovered and removed from the earth. Go to the industry and vehicle pool.</p> <p>Beginning form: fossil fuels</p> <p>Process: mining</p> <p>End form: fossil fuels</p>
<p>You are carbon in the form of fossil fuels. It is many years until you are discovered.</p> <p>Beginning form: fossil fuels</p> <p>Process: storage</p> <p>End form: fossil fuels</p>	<p>You are carbon in the form of fossil fuels. You are discovered and removed from the earth. Go to the industry and vehicle pool.</p> <p>Beginning form: fossil fuels</p> <p>Process: mining</p> <p>End form: fossil fuels</p>

Litter and Waste Cards

<p>You are carbon in the form of organic material that cannot be broken down by bacteria or fungi. You stay in the litter & waste pool.</p> <p>Beginning form: organic matter</p> <p>Process: humification</p> <p>End form: organic matter</p>	<p>You are carbon in the form of organic material. You are broken down by bacteria & fungi. Go to the bacteria and fungi pool.</p> <p>Beginning form: organic matter</p> <p>Process: decomposition</p> <p>End form: inorganic carbon</p>
<p>You are carbon in the form of dead plants and animals. You are covered quickly by soil and buried. Go the fossil fuel pool.</p> <p>Beginning form: organic matter</p> <p>Process: pressurization</p> <p>End form: fossil fuels</p>	<p>You are carbon in the form of organic material that cannot be broken down by bacteria or fungi. You stay in the litter & waste pool.</p> <p>Beginning form: organic matter</p> <p>Process: humification</p> <p>End form: organic matter</p>
<p>You are carbon in the form of organic material. You are broken down by bacteria & fungi. Go to the bacteria and fungi pool.</p> <p>Beginning form: Organic matter</p> <p>Process: decomposition</p> <p>End form: inorganic carbon</p>	<p>You are carbon in the form of dead plants and animals. You are covered quickly by soil and buried. Go the fossil fuel pool.</p> <p>Beginning form: organic matter</p> <p>Process: pressurization</p> <p>End form: fossil fuels</p>

Ocean Cards

<p>You are carbon in the form of bicarbonate (baking soda). You are stored in the ocean. Beginning form: bicarbonate Process: storage End form: bicarbonate</p>	<p>You are carbon in the form of bicarbonate (baking soda). You are released into the atmosphere as CO₂. Go to the atmosphere pool. Beginning form: bicarbonate Process: chemical form change End form: CO₂</p>
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Vegetation Cards

<p>You are a sugar in a plant that goes through respiration to provide energy to the plant and now you go to the atmosphere Beginning form: carbohydrate Process: respiration End form: CO₂</p>	<p>You are now sugars in a leaf that have been eaten by an animal. Go to the animal pool. Beginning form: carbohydrate Process: consumption End form: organic matter</p>
<p>You are sugars that are being stored in the plant. Beginning form: carbohydrate Process: storage End form: carbohydrate</p>	<p>You are carbon in a leaf that has fallen off, of the tree. Go to the litter and waste pool. Beginning form: carbohydrate Process: death End form: organic matter</p>
<p>You are carbon in the form of sugars given off by the roots to feed bacteria and fungi to provide nutrients. Go to the bacteria and fungi pool. Beginning form: carbohydrate Process: consumption End form: organic matter</p>	<p>You are carbon that has been released by burning a plant. Go to the atmosphere as CO₂. Beginning form: carbohydrate Process: combustion End form: CO₂</p>

Carbon cycle worksheet

<p><i>Station 1</i> Pool: <u>Vegetation</u> Beginning form: _____ Process: _____ End form: _____</p>	<p><i>Station 6</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>
<p><i>Station 2</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>	<p><i>Station 7</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>
<p><i>Station 3</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>	<p><i>Station 8</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>
<p><i>Station 4</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>	<p><i>Station 9</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>
<p><i>Station 5</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>	<p><i>Station 10</i> Pool: _____ Beginning form: _____ Process: _____ End form: _____</p>

