FOCUS READERS

Lesson Plan

Carbon Capture

Book: *Energy from Algae*
Series: Energy for the Future
Level: Navigator

Objective
To help students understand the relationships among algae, the carbon cycle, and climate change by using an online interactive.

Supplies
- *Energy from Algae* book
- Access to the PBS Learning Media site "Carbon Dioxide and the Carbon Cycle": https://www.pbslearningmedia.org/resource/pcep14.sci.ess.co2cycle/carbon-dioxide-carbon-cycle/
- Computer access for students
- Whiteboard

Before the Activity
Read through the *Energy from Algae* book, or assign it to students to read on their own. Pull up the PBS Learning Media website in your web browser. In the column on the right side, click "Support Materials for Use with Students." Pull up the "Carbon Dioxide and the Carbon Cycle – Background Essay."

Activity
Explain to students that making and using clean energy is one way to slow climate change. But there are other ways to stop greenhouse gases from getting into Earth's atmosphere. For example, the *Energy from Algae* book describes the role algae can play in storing carbon dioxide (CO_2). CO_2 in the atmosphere is a greenhouse gas and a driver of climate change. By removing CO_2 from the atmosphere and storing it elsewhere, people can reduce climate change. This process is called carbon sequestration.

The background essay on the website describes what global warming and climate change are, as well as the role that carbon dioxide plays in both. Read the essay as a class, choosing a different student to read each paragraph out loud. Then click "Launch" to open the interactive.

The "Carbon Cycle Reservoirs" tab on the interactive shows the different reservoirs that store Earth's carbon. Have students click on the different buttons to learn how carbon flows in and out of different reservoirs. Students can also click on the "CO_2 and the Atmosphere" tab to compare how carbon cycled 300 years ago with how it cycles today. The "Temperature and CO_2" tab charts the change in atmospheric CO_2 and temperature over the past 1,000 years. As students explore the interactive, they should consider the following questions:

- What role do fossil fuels play in the carbon cycle and in climate change?
- What role do algae and algae fuel play in the carbon cycle and in climate change?
- What other things could possibly help capture carbon to slow climate change?

After giving students time to explore the interactive, bring the class back together and have students discuss the first two questions. Potential answers include:

- Fossil fuels store 10,000 gigatons of carbon under Earth's surface, but they release carbon when they are burned for energy. Burning fossil fuels affects the carbon cycle by bringing huge amounts of CO_2 into the atmosphere and thereby contributing to climate change.
- Algae are a type of biomass. Algae and other biomass store 2,500 gigatons of carbon. Algae affect the carbon cycle by taking CO_2 from the atmosphere during photosynthesis. When eaten or burned as fuel, algae release CO_2 back into the atmosphere.

Then have students brainstorm answers to the third question. Write students' answers on the board. Potential answers and further information about each include:

- Reforestation, since burning or cutting down forests puts extra CO_2 into the air: https://www.bbc.com/future/article/20200521-planting-trees-doesnt-always-help-with-climate-change
- Changes to agriculture, such as soil carbon sequestration, so it releases less CO_2: https://www.american.edu/sis/centers/carbon-removal/fact-sheet-soil-carbon-sequestration.cfm

Evaluation
Could students explain how algae and fossil fuels affect the carbon cycle? Could they connect the carbon cycle to climate change? Could they brainstorm reasonable ideas for other ways to capture carbon and slow climate change?

Standards
This lesson may be used to address the Common Core State Standards' reading standards for informational text, grade 5 (RI 5.3, 5.7), and the National Science Education Standards' Content Standard D, grades 5–8.