



## Classroom Teacher Preparation

### Life Science 26: Carbon Cycling – A Virtual Lab

Please use the following to prepare for the next SfS lesson.

#### Description:

This lesson provides an opportunity to investigate the processes of cellular respiration and photosynthesis in living organisms and will highlight how carbon dioxide and oxygen cycle through a biological system. During the virtual activity, students observe the interaction of a snail and a water plant in a closed environment and use a chemical indicator to determine the presence of carbon dioxide in the environment. The experiment will be instructor-led, with the focus on student analysis of the experimental data.

#### Lesson Objectives – SWBAT (“Students Will Be Able To...”):

6<sup>th</sup>-8<sup>th</sup>

- Analyze experimental data to provide evidence that during photosynthesis, plants use CO<sub>2</sub> and produce O<sub>2</sub>
- Identify an error in experimental data

#### Disciplinary Core Idea (DCI)

LS1 From Molecules to Organisms: Structures and Processes – LS1.C ... Energy Flow in Organisms

- (6<sup>th</sup>-8<sup>th</sup>) Plants use the energy from light to make sugars through photosynthesis. Within individual organisms, food is broken down through a series of chemical reactions that rearrange molecules and release energy

#### Science & Engineering Practice (SEP)

Analyzing and Interpreting Data

- (6<sup>th</sup>-8<sup>th</sup>) Analyze and interpret data to provide evidence for phenomena

#### Crosscutting Concept (CCC)

Energy and Matter

- (6<sup>th</sup>-8<sup>th</sup>) Matter is conserved because atoms are conserved in physical and chemical processes.

#### Preparation:

**Content:** While the virtual experiment for this lesson investigates how CO<sub>2</sub> cycles through a biological system, the real focus of the lesson is on the skill of data analysis. In order to get the most out of this lesson, students should already be familiar with photosynthesis and cellular respiration, particularly the products of the reactions. This is **not** an introduction to photosynthesis. The emphasis is on data analysis in an experiment. A solid understanding of photosynthesis is critical to successfully completing this activity.

**Materials:**

This lesson is a virtual experiment that must be completed on computers. If your school has computers or a computer laboratory, reserve as many computers as necessary for students to work in groups of 2-3. An internet connection/WiFi is necessary. This lesson can take place in the classroom with computers, on laptops, or in a computer lab. SfS has a small



number of laptop computers available if the school is equipped with WiFi. Computers with sound are preferred, but not necessary.

If possible, please bookmark the following link on your school browsers: <https://tinyurl.com/sfsls26>

**Please provide instructors with directions and passwords for accessing the Internet.**

### **Room Set Up for Activities:**

Students will work in groups of 2-3. It will be necessary to seat all students in the group at each computer terminal. A small amount of instructor table space is desirable for the instructors to prepare and display the demonstration.

### **Safety:**

There are no safety precautions for this lesson.

### **Related Modules:**

This lesson may be taught as part of a sequence or group of related modules on **Experimental Design and Analysis**, using life science concepts. Modules include:

*Life Science 18: A Vitamin C Experiment* - Students learn about the relationship between nutrition and fresh/processed foods, and then verify this information by measuring the concentration of vitamin C in different forms of orange juice.

*Life Science 27: Investigating Photosynthesis* - Older students examine the effects of light, temperature, and carbon dioxide on the oxygen levels produced by a photosynthetic leaf.

For other module sequences and groups, look here: [www.sciencefromscientists.org/sequences](http://www.sciencefromscientists.org/sequences)

### **Standards Covered:**

Please click the following link to our website to review the standards covered by this lesson, listed by state: [www.sciencefromscientists.org/standards/](http://www.sciencefromscientists.org/standards/)

Lessons are matched to both national NGSS and local state standards.

### **After Our Visit:**

Our Classroom Post can be found on our website at [sciencefromscientists.org/cohorts](http://sciencefromscientists.org/cohorts). Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at [sciencefromscientists.org/open-response-questions](http://sciencefromscientists.org/open-response-questions). They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

For an Extension activity, we recommend students create a Tabletop Biome, using the instructions available here: <http://scribbit.blogspot.com/2010/05/kids-summer-crafts-build-ecosystem.html>

### **Additional Resources:**

- Learn more about Biosphere 2 – Arizona’s Human Biodome Experiment (16:55): <https://www.youtube.com/watch?v=-yAcD3wuY2Q>
- Another type of Biodome -- How To Make a Tabletop Biosphere in a Jar: [http://cdn.makezine.com/make/wp\\_aquanaut.pdf](http://cdn.makezine.com/make/wp_aquanaut.pdf)
- Make it at Home Table Top Biosphere (2:28): <https://www.youtube.com/watch?v=56lQy-30CB4>
- Overview of Photosynthesis and Respiration Interactive Website (requires Flash): <http://www.biology.emory.edu/multimedia/animation/source2/CH10ReviewRespirationPhotosynthesis.swf>
- Cellular Respiration -The Big Picture (requires Flash): <http://www.sumanasinc.com/webcontent/animations/content/cellularrespiration.html>