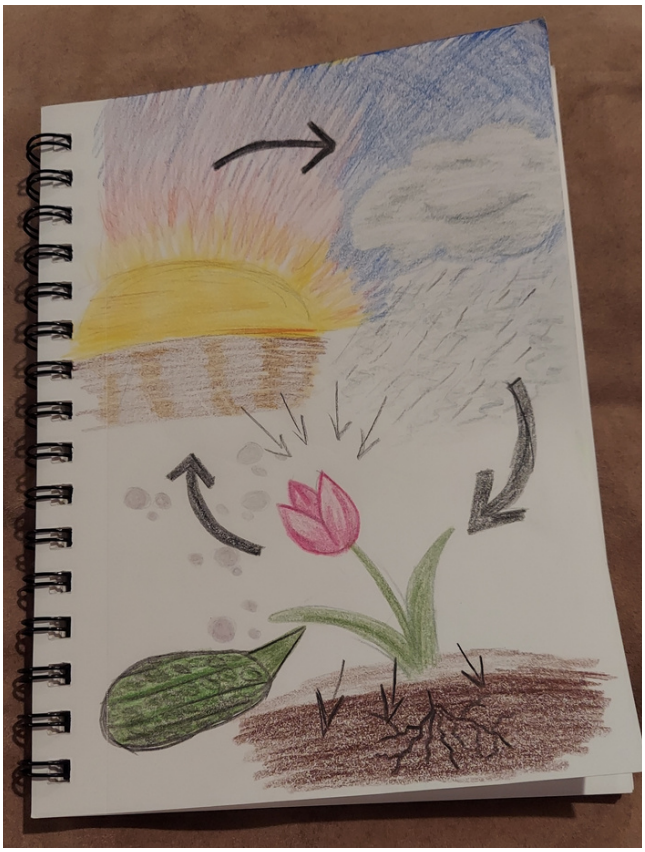
MoNA
Museum of Northwest Art

Carbon Cycle Drawings Inspired by Rachel D. Lodge

A HANDS-ON ART ACTIVITY
DESIGNED BY
MONA EDUCATION STAFF

Age: Grade 5-8
Lesson Duration: 60+ minutes
Subjects: Art and Science



Student Example
Image Source: MoNA Intern

Description

This lesson provides an opportunity to learn four words that describe how carbon cycles from plants and living things into the atmosphere and how carbon is used again as it recycles back into plants and living things on earth, creating a cycle. Students will study Rachel D. Lodge's art to see how she illustrates these "invisible" processes and the wonder of it all. Students will learn that carbon takes up various forms as they diagram the carbon cycle that teaches how carbon can be recycled and builds life on our planet earth.

Materials

- pencils
- paper
- colored pencils, markers, and/or crayons

Instructions

1. Begin by viewing this video "Inhale/Exhale" by Rachel D. Lodge.
2. Discuss the video and determine what students know about carbon, carbon footprint, or changes that are leading to climate changes as the carbon cycle becomes out of balance.
3. You can follow the video by examining some examples of Rachel D. Lodge's work and using Visual Thinking Strategies (VTS) to lead a discussion. More information on VTS images of he work are included at the end of this lesson plan.
4. Use the following pages to introduce each of the four words and answer any questions students have.
5. Pass out materials and invite students to complete one or both of the drawing prompts listed: diagram of photosynthesis or parts of the carbon web.
6. Follow the Closure section for discussion and reflection.

Big Goals

- Students will understand the definitions of the words photosynthesis, decomposition, respiration, and combustion.
- Students will increase their sense of wonder about the air we breathe.
- Students will become better stewards of the planet and share ideas of small changes they can make to reduce their own carbon footprint.

Questions

- How can an artist help us understand something that is invisible?
- Can animals photosynthesize energy from the sun? (Would they need to be green or have leaves for hair?)
- What processes add CO2 to the atmosphere, which can take it away?
- What is causing the carbon cycle to go out of balance?
- What changes will make a difference to help our planet?

The Carbon Becomes Part of Them, Rachel D. Lodge

1st word to help explain the carbon cycle: **PHOTOSYNTHESIS**

Carbon dioxide plus water combined in the presence of sunlight and chlorophyll in a leaf yields glucose and oxygen. Photosynthesis, in other words, is the process in which air, light, and water are combined out of “nothingness” into sweet morsels of sugar- the stuff that becomes redwoods, daffodils, and all the amazing plants on earth. Photosynthesis is the link between the inorganic realm and the living world, making the inanimate live as plants give us food for energy and air to breathe!

Tropical, Rachel D. Lodge

2nd word to explain part of the carbon cycle: **RESPIRATION**

Respiration is a process in living organisms that produces energy by breathing in oxygen to oxidize food and then breathing out carbon dioxide. Animals breathe in oxygen that is used in the cells of our bodies to burn fuels and then release carbon dioxide back into the atmosphere. In other words, there are two phases to breathing - **inhaling oxygen** and **exhaling carbon dioxide**. Animals rely on plants for food, energy, and oxygen. Our cells require oxygen to break down the food we consume through cellular respiration. The CO2 released from respiring cells can be used in photosynthesis again, which creates balance and harmony in the cycle. When plants use solar energy to break apart that same carbon dioxide in the air through photosynthesis, they reverse the cycle by **taking in carbon** for plant material and then **replenishing oxygen** for animals to breathe.

Adding CO2 to the air from respiration completes the natural carbon cycle.

Rangeland, Rachel D. Lodge

3rd word to explain part of the carbon cycle: **DECOMPOSITION**

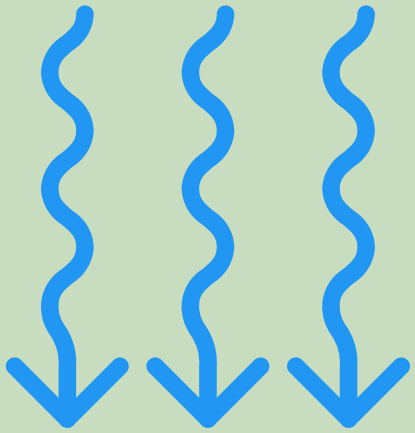
By mostly using sunlight, water and carbon dioxide, plants can grow. In turn, animals consume food for energy using O2 and giving off CO2. When they die, they decay and decompose. Decomposition is the process of breaking down plants and animals. Over vast periods of time, layers of sediment build on each other. Because of the pressure and heat from within the Earth's crust, this generates fossil fuels like coal, oil and natural gas (methane). Over millions of years, the decomposition of dead matter generates fossil fuels.

Pero No Soy Fumador, Rachel D. Lodge

4th word to help explain the carbon cycle: **COMBUSTION**

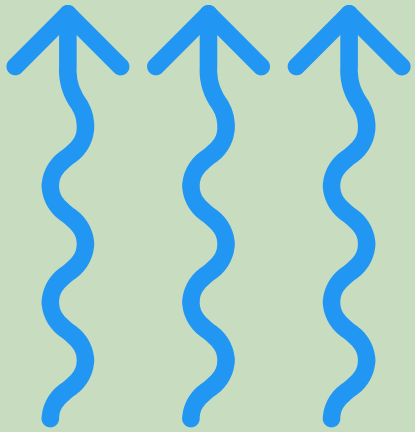
We extract fossil fuels to power our cars and factories that use the energy released by combustion when fossil fuel is burned. A byproduct of combustion is that it releases carbon dioxide back into the atmosphere. Carbon dioxide is one of the greenhouse gases contributing to climate change.

Adding CO2 to the air from combustion daily causes imbalances in the carbon cycle.



List how carbon is **removed** from the atmosphere:

List ways carbon is **released** into the atmosphere:

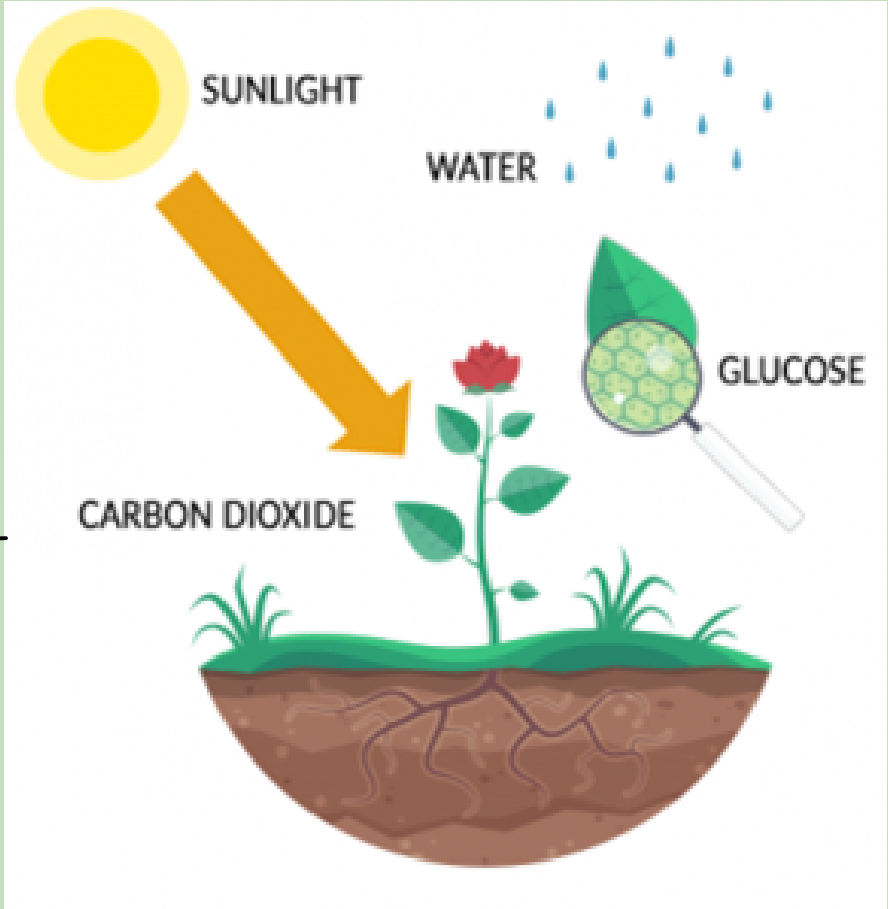


How does the carbon cycle balance?

Photosynthesis and respiration **balance** the carbon cycle. Combustion **imbalances** the cycle.

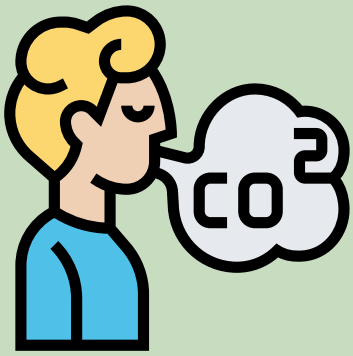
Draw a diagram of photosynthesis

If possible, draw a plant outside your classroom that you can observe, so you can look closely



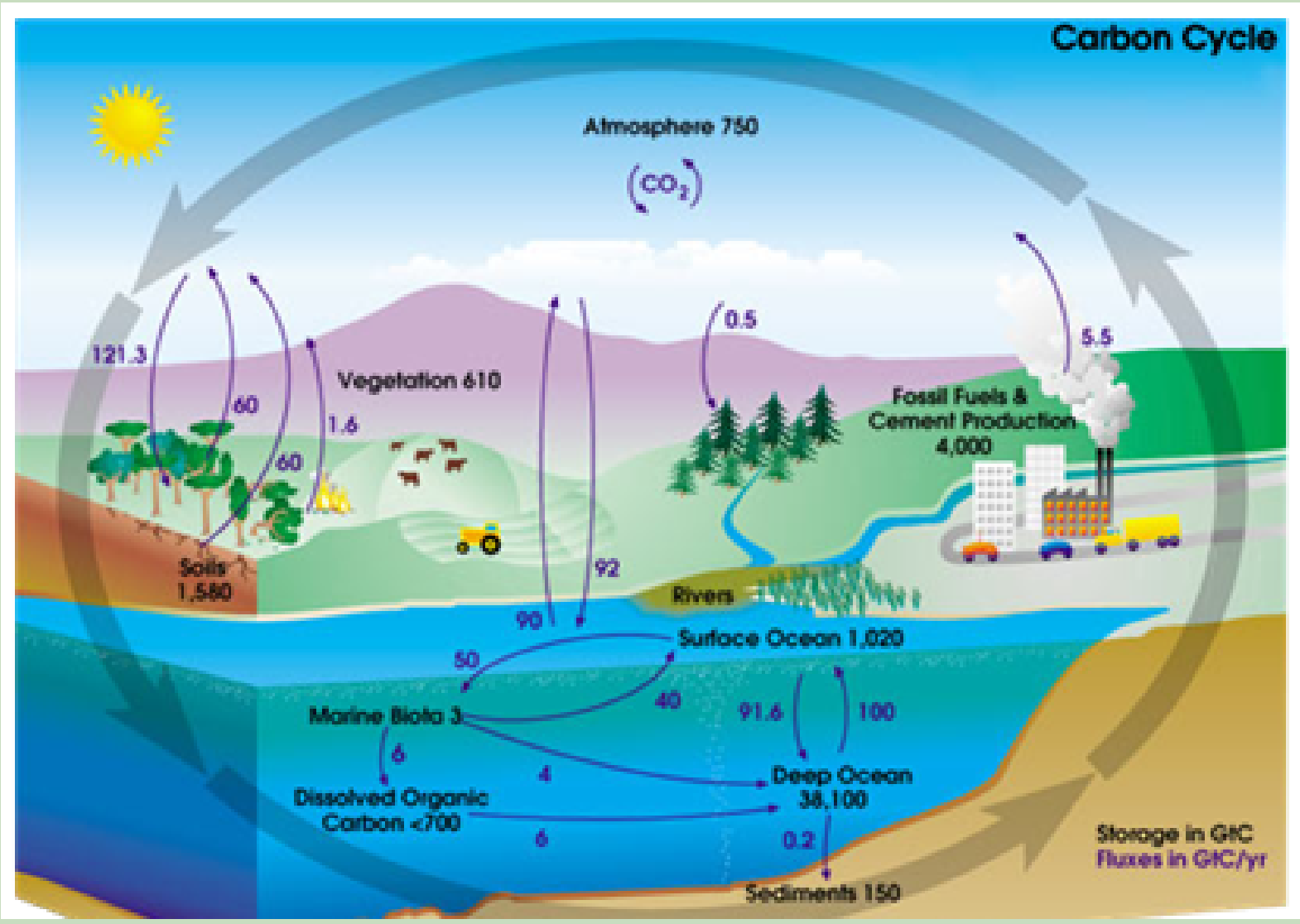
Photosynthesis

Plants pull in **carbon dioxide** out of the air through a process called **photosynthesis**. This is how photosynthesis works. Plants obtain water through their roots which rises to the leaves. There, a green pigment called **chlorophyll** uses energy from the sun to split water into hydrogen and oxygen. At the same time, carbon dioxide is entering the leaf through leaf pore openings called **stomata**. Next the hydrogen is combined with the carbon dioxide which makes a sugar compound called **glucose**. The leftover oxygen is released into the air and helps replenish what we and all animals need for breathing. The plant uses the carbon **sequestered** in the glucose to grow. Not only does photosynthesis pull carbon dioxide out of the atmosphere, but it fuels all living things as a source of energy when the plants are eaten by animals.



Draw parts of the carbon web

Draw things in your environment like Rachel Lodge did to illustrate each process in the Carbon Cycle



Closure

Imbalance in the carbon cycle affects everyone. It's up to us to respond to the changes we cause by making carbon-conscious decisions to help sustain our planet.

1. Pledge to make small changes so you can reduce your own carbon footprint.
2. Pledge changes together with your class community to make a bigger difference.
3. Support community organizations that are working to reduce carbon emissions and draw down global warming,

Some ideas for small changes:

Follow the 3 R's - REDUCE,REUSE,RECYCLE.
Create recycle bins.
Plant a tree.
Eat sustainably - Take all you need, but eat all you take.
Pick up trash, clean up after pets.
Ride your bike for local trips.
Ask parents to reduce gas emissions and not let the car idle.

As a class you could pledge to...

Turn off things that use electricity.
Use a refillable water bottle.
Reuse bags
Read about ways other people are working to reduce global warming.
Takes things to thrift stores.
Turn off running water.

Vocabulary

- carbon cycle
- photosynthesis
- decomposition
- respiration
- combustion

Learning and State Standards

Fulfills **Washington State Arts Learning Standards**:

- **VA:Re7.2.HS Analyze how one's understanding of the world is affected by experiencing visual imagery.**
- **VA:Cn1 1.HS Visualize and hypothesize to generate plans for ideas and directions for creating art and design that can affect social change.**
- **VA: Cr1.2.4 Collaboratively set goals and create artwork that is meaningful and has purpose to the makers.**
- **VA:Cr2.3.4 Document, describe, and represent regional constructed environments.**
- **VA:Re7.1.HS Hypothesize ways in which art influences perception and understanding of human experience.**
- **VA:Re7.2.3 Determine messages communicated by an image.**

Visual Thinking Strategies

MoNA's Education programs utilize Visual Thinking Strategies (VTS), which is a research-based teaching method that promotes aesthetic development including critical thinking and communication skills. Here in the MoNA, we use VTS to engage students and general visitors with art encouraging them to observe closely, think critically and discuss respectfully; however, VTS can be effectively used across curricula. This approach teaches its participants how to take the time to observe closely, describe what they see in detail and provide evidence for their observations. Students learn that their reflections and thoughts are valued and appreciated in this inclusive teaching method.

In order to facilitate a VTS discussion, you first encourage viewers to take a quiet moment to observe the work you are going to explore. Then you ask the following questions and paraphrase the responses without adding any of your own judgements. You can insert additional vocabulary and point to specific parts of the artwork.

What's going on in this picture?
What do you see that makes you say...?
What more can you find?

Visual Thinking Strategy Links

If you are interested in learning more about VTS, here is their website. If you already know and love VTS, but want help finding great images to use in your classroom, here is a fantastic gallery. You can also visit this website for additional resources: www.monamuseum.org/resources-for-educators

Meet the Artist: Rachel D. Lodge

Rachel D. Lodge is a mainly self-taught Seattle artist. Early in her career, her art focused on human characters and emotion. This work was mostly drawing, painting, and small sculpture.

More recently, she has explored carbon cycles and our climate system. She has created science based images, animation, and prints. These works are not only striking to look at, but teach the viewers about carbon cycling, photosynthesis, and even the human breath. These ideas are often hard to imagine since we cannot see much of the process with the naked eye. Her work has been exhibited all over the Puget Sound region as well as California.

Source: http://www.racheldlodge.com/about.html