

EVERY ACTION MATTERS

CLASSROOMS TAKE CHARGE

Service-Learning Lesson Plan

Project: Siuslaw Carbon Containers

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Project Overview: Students explore the usage of electricity at their high school and in their homes. Students research various ways to reduce their energy consumption and use their findings to calculate potential monetary savings. Findings are presented to community groups to increase awareness of energy and cost saving potential of small lifestyle changes.

Learning Objectives

During the year-long advanced chemistry course, Carbon TIME is introduced when students are learning about types of chemical reactions (e.g., combustion reactions and the products of reacting hydrocarbons). Students revisit the idea of fossil fuel burning during the thermochemistry unit and explore the amounts of energy released during fossil fuel combustion. This leads into lessons about alternative ways to generate energy. In the final unit of the school year, students determine where the carbon that is released into the atmosphere ultimately ends up and the consequences of the various carbon sinks.

How were the learning objectives evaluated?

At the end of the semester, students were tasked with determining what was causing oysters to die on the Oregon Coast. The students used the knowledge and understanding gained throughout the school year to construct a written explanation of the chemical processes that are occurring (combustion of hydrocarbons, equilibrium between atmosphere and ocean, formation and dissociation

Subject Areas: Chemistry

Grade Levels: 11th and 12th

Materials Needed:

- Required: Computers, poster paper, markers
- Optional: Color printer, photo paper, button maker, canvas grocery bags, canvas paint, small boxes for recycleable collection

Key Partners:

- Siuslaw Newspaper - sent in article to the school zone insert in the paper
- Elementary and Middle School principals - contacted to expand recycling program to other schools

Time Required to Complete Project:

- Two weeks for integrated science, Two months for chemistry

of weak acids, pH levels and buffering systems) as well as a model that can be used to explain the process from source to sink.

Service Objectives

At the conclusion of the semester, chemistry students were tasked with determining various methods to reduce the amount of carbon dioxide released into the atmosphere. The students chose to focus of their projects to be either their homes or

the school, all groups chose the school. The main objective was for the students to come up with one change that can be done to make a difference and how they can implement that change.

Students projects included 1) collecting used markers from classrooms throughout the district and recycling them, 2) collecting used crayons from classrooms throughout the district and from local restaurants and making them into reusable crayons, 3) decorating reusable canvas grocery bags and distributing them to the teachers to encourage use of reusable grocery bags and reduce the amount of plastic that is discarded, and 4) creating posters to encourage people to turn lights off after leaving rooms to reduce the amount of energy used at the school.

How were the service objectives evaluated?

Service objectives were evaluated based on if groups of students completed their projects and were able to implement them in the community or in the school. Student reflection was conducted as a large group and was based around how much of an impact their projects would have and what more needed to be done.

Human Energy Systems Units Used (For lesson plans visit: carbontime.bsccs.org)

Activity 1.1 Human Energy Systems Unit Pretest

Activity 3.1 Millions of Flasks of Air

Activity 3.2 The CO₂ Trend: Your Ideas about the Keeling Curve

Activity 3.3 Why We Care About the Keeling Curve

Activity 4.1 Finding the Carbon

Activity 4.3 The Seasonal Cycle

Activity 4.4 Zooming Into Fossil Fuels

Activity 4.5 Follow the Carbon

Activity 5.2 Energy Scenarios

Activity 6.1 How We Use Organic Carbon

Activity 6.3 Secrets Revealed

Project Milestones

- Introduce problem of climate change (April)
- Students begin testing ideas about climate change (May)
- Students learn about carbon dioxide (May)
- Students begin making plans for how they want to mitigate carbon dioxide (May)
- Students begin making plans for how they want to mitigate carbon dioxide (May)
- Students implement changes (June)



Photo: Sample of the custom student designed reusable grocery bags.

Lessons & Activities (See below.)

- Carbon Time flowchart
- Example outreach: Posters
- Example outreach: Light Switch Signs

Celebrating Student Accomplishments

We launched rockets! We also painted more re-usable grocery bags.

Carbon TIME Daily Flowchart:

Day 1:

- Warm-up: What is carbon dioxide
 - Discuss what the students know about carbon dioxide without evaluating answers
- Take students to computer lab to sign up for Communities Take Charge

Day 2:

- Warm-up: Take pre-test
- Guided reading of Millions of Flasks of Air
 - Students will work in table groups to answer questions from reading
 - Students will be asked to circle words that they are not familiar with and write them in a vocabulary list
- Students will work in partnerships to complete the Keeling Curve WS

Day 3:

- Warm-up: What is causing the upward trend in carbon dioxide concentrations?
- Discuss what is causing the seasonal cycle
- Why would this matter?
 - Greenhouse effect notes and discussion

Day 4:

- Warm-up: What effect does increasing the carbon dioxide concentrations have on the Earth?
- Greenhouse effect lab

Day 5:

- Warm-up: Where does the extra carbon dioxide come from?
- Fossil fuels
 - Formation of fuels
 - Presentation 2.4 and 2.5 from Carbon TIME
- Burning fossil fuels – organic vs. inorganic carbon

Day 6:

- Warm-up: How are fossil fuels formed?
- Formation of fossil fuels – Coal and Oil
- How do we know we are increasing carbon dioxide concentrations?
 - Volcanoes vs. Burning fuel
 - Carbon-13
- Global warming and climate change (Cosmos)
 - History of temperature changes (15:00)
 - Weather vs. Climate (19:00)

Day 7:

- Carbon Cycle
- Ocean acidification, sea level rise – presentation by chemistry students

Day 8:

- Ocean acidification activity
 - Bromothymol blue in beakers, blow into beakers and light candles
- How to stop climate change?

Day 9:

- Warm-up: What is the carbon dioxide curve called?
- How do we know the upward trend is due to human activity?
 - Natural sources of carbon dioxide
 - Carbon-13

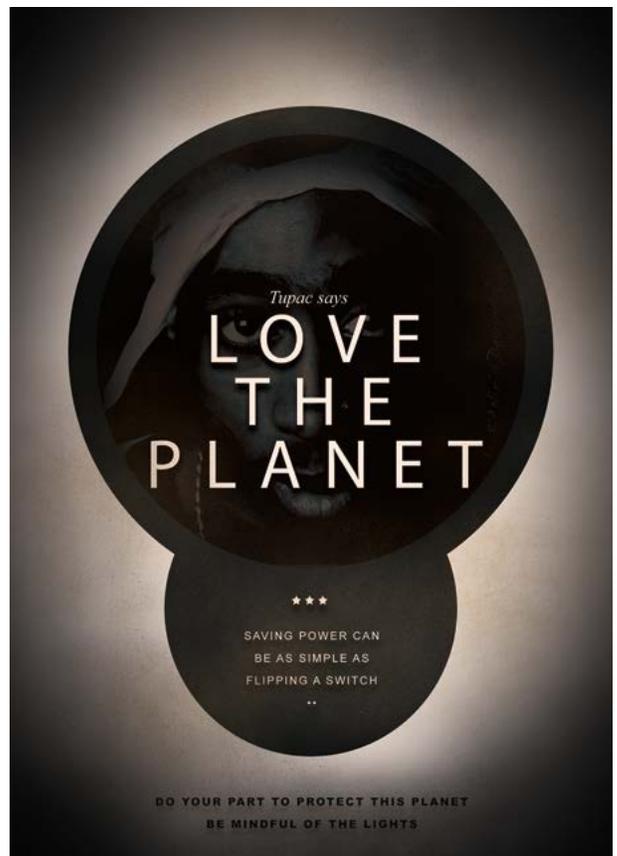
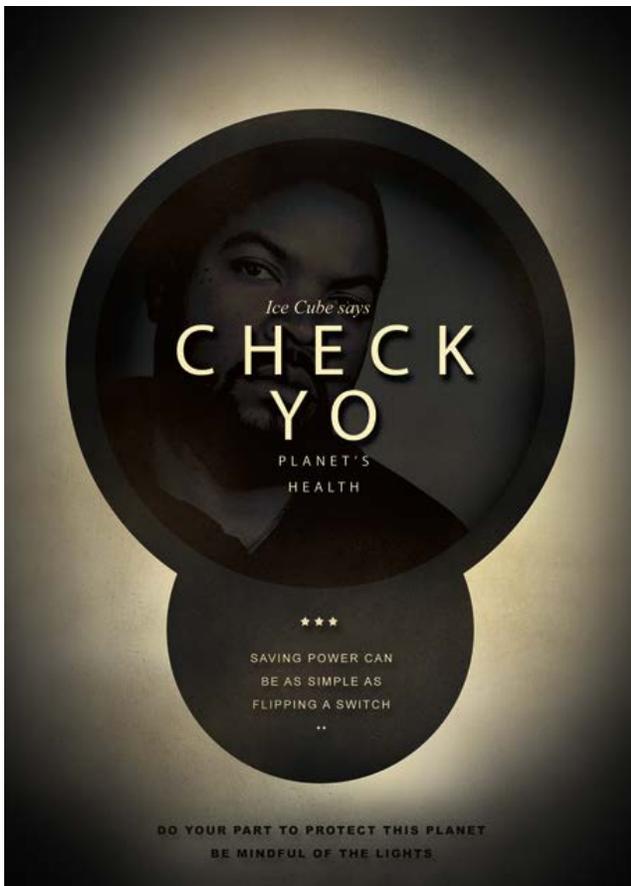
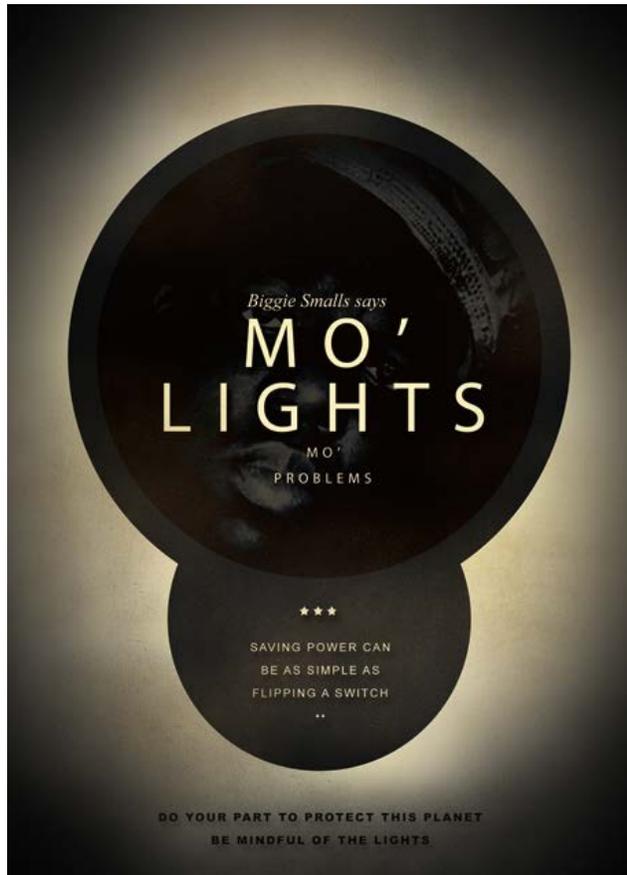
Day 10:

- Warm-up: What activities contribute to increased carbon dioxide concentrations?
- Mitigation strategies individually, locally and globally for reducing carbon dioxide

Day 11:

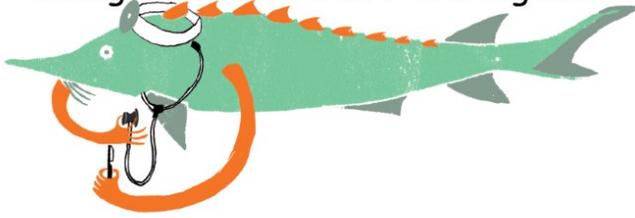
- Warm-up:
- Carbon TIME post test

Example Outreach Posters



Example Light Switch Signs

You Don't Have To Be A Brain Sturgeon To Turn Off The Lights!



BRAIN STURGEON

SAVE THE SHELLFISH!

