APRIL 2012

the Carbon TIMEs

In This Issue

Andy's Message

Now that the Ecosystems unit is up on the website, we just have one more unit to go: Human Energy Systems. We are working on two main themes for this last unit: **1) Understanding global carbon cycling.** We will investigate (a) how seasonal variations in carbon transforming processes cause the concentration of carbon dioxide in the atmosphere to go up and down every year, and (b) how combustion of fossil fuels increases concentration a little every year. **2) Connecting lifestyles to carbon footprints.** Students will investigate how lifestyles in different countries lead to different carbon footprints, and how the technologies that support our lifestyles depend on combustion of fossil fuels. We're also starting to look forward to summer and next year. We are analyzing student data now, and thanks to your comments we already have a long list of revisions to do over the summer. We will also be developing some stories and video support materials that we are excited about. More on that next month!

Upcoming Events & Important Dates

KBS Workshops

April 11

We're looking forward to the upcoming KBS workshops.

Human Energy Systems Unit

Early May

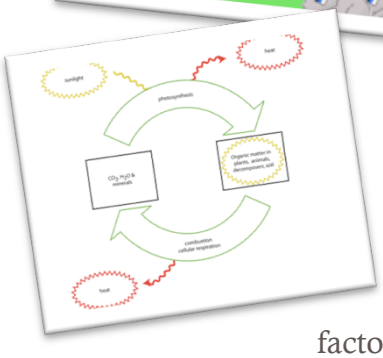
This unit is in the works!

Summer Workshop

May 2

This KBS workshop will include Cohorts 1 and 2.

Ecosystems Unit



The Ecosystems Unit is finally here! Thank you teachers for your patience as this unit has been completed. We are excited to hear from you regarding your impressions of the activities, parts you like, and ideas for improvement. Here is a brief overview of the activities in the unit:

Core Lesson 1 – Introduction

Activity 1 – Unit Pre Assessment

Activity 2 –Where is the Carbon? Students make initial explanations about where carbon is stored in different ecosystems.

Core Lesson 2 – Sunny Meadows

Activity 1 – Sunny Meadows Investigation. Students make predictions about how to maximize biomass in an ecosystem.

Activity 2 – Sunny Meadows Investigation. Students play an online simulation game about biomass in ecosystems.

Activity 3 – Sunny Meadows Results. Students use claims, evidence, and reasoning to explain the patterns they observed in the Sunny Meadows investigation.

Core Lesson 3 – The Carbon Games

Activity 1 – The Carbon Game I – Meadow. Students roll dice to determine their fate as they move through a simple ecosystem.

Activity 2 – Charting Our Paths. A series of interactive excel graphs help students examine data they collect during the carbon game.

Activity 3 – Tracing Our Paths. A series of diagrams helps students examine carbon and energy in simple ecosystems.

Activity 4 – Pools & Fluxes. Students read a short article about what factors might change the sizes of pools and rates of fluxes in an ecosystem.

Activity 5 – The Carbon Game II – Organic/Inorganic. Students play a second version of the carbon game that focuses on two pools of carbon (organic and inorganic).

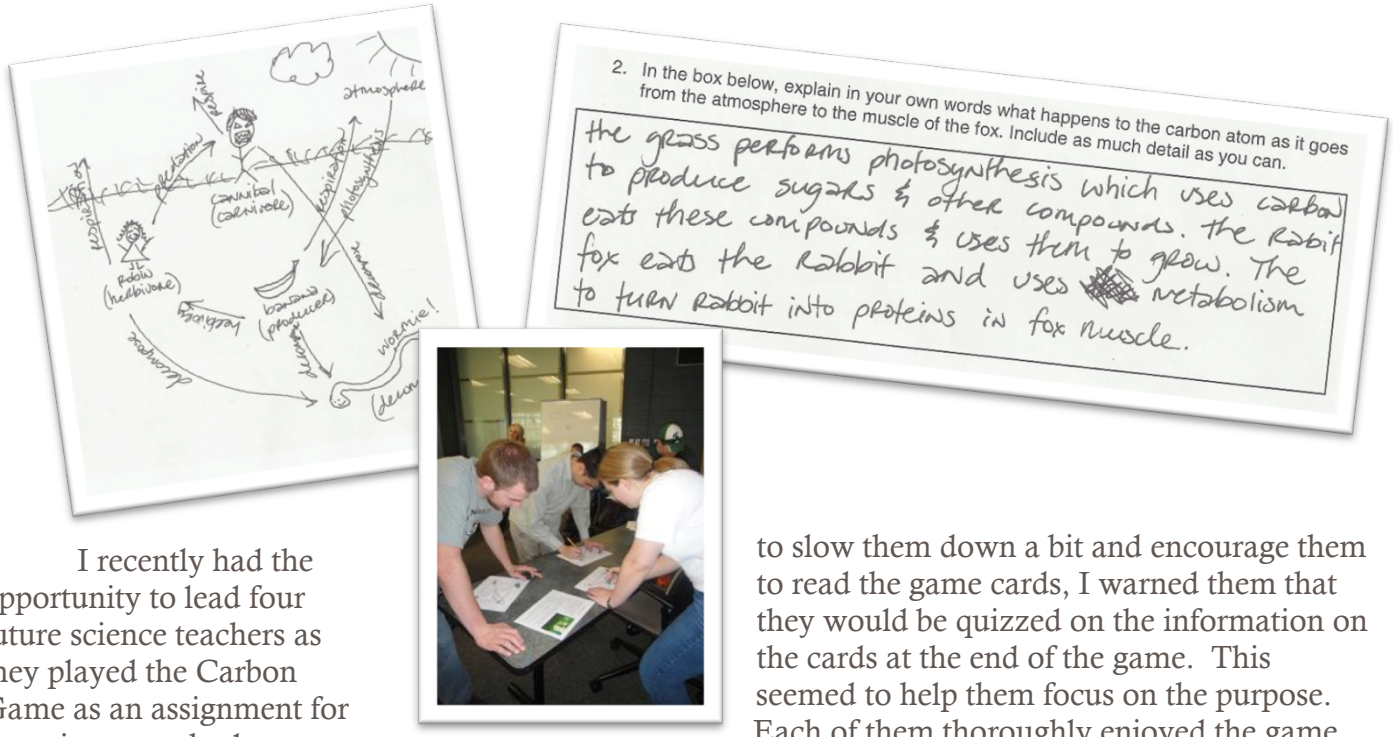
Activity 6 – The Carbon Game III – Farm. This third version of the carbon game encourages students to compare the carbon cycle between a plant-based diet and a meat-based diet.

Core Lesson 4 – Local Connections

Activity 1 – Draw your own ecosystem.

Activities 2-5: Please have a look at our suggestions for an application lesson here and let us know what you think might work best! We would like your opinions about which application activities might be effective for helping students make connections between the ecosystems discussed in the unit and the ecosystems in their own neighborhoods.

Trying the Carbon Game with MSU undergrads



I recently had the opportunity to lead four future science teachers as they played the Carbon Game as an assignment for my science methods course. One of my classmates is a chemistry major, two are earth science majors, and the other is a biology major. As a pre-assessment, I provided a worksheet with a picture of an ecosystem including grass, trees, bunnies, and a fox and asked them to draw arrows to show how they believed carbon dioxide cycles through the ecosystem in the picture. They had a general idea, but one of the students drew a pathway instead of a cyclical representation. After the assessment, my classmates got in the competitive spirit and were determined "to become a carbon molecule" that was incorporated into the muscle of a fox. Their enthusiasm was great but in order to slow them down a bit and encourage them to read the game cards, I warned them that they would be quizzed on the information on the cards at the end of the game. This seemed to help them focus on the purpose. Each of them thoroughly enjoyed the game. There was only a little confusion about when to color in arrows. It was decided that every time the students rolled a die they would color in an arrow.

After the game, my classmates drew their own unique ecosystems explaining how matter is cycled. The only requirements were that they contain a carnivore, an herbivore, and plants. They drew some very creative ecosystems and produced some humorous pictures. Overall, playing the carbon game with future science teachers went well and by the end everyone was caught up on the Carbon Cycle.

-Courtney Lannen, Undergraduate Researcher

Announcements

The environmental literacy website now has the Ecosystems Unit posted as well as an updated version of the interview protocol.

The wiki now has feedback forms for the Ecosystems Unit posted. Parts I and II can be edited continuously as you go through the unit, and Part III should be completed once at the end.

Notes from the Field

"My students enjoy the activities that we have been doing - they really liked the mealworms! My students are still having some trouble with the idea of predictions, claims and evidence. If anyone has ideas on how to help middle school students distinguish between them, I would love to hear them."

-Becky Drayton, Gobles Middle School, MI

Carbon TIME at NSTA

Andy and I were in Indianapolis last month to present a short course on learning progressions. The course, "Using Learning Progressions to Improve Science Teaching and Learning," was attended by close to 70 teachers and curriculum directors from districts across the country. We sorted student responses to the Carbon TIME assessment question, "What happens to the atoms in fat when you lose weight?" As always, everyone was amazed at what students say. The attendees were eager to learn about how learning progressions can be useful for assessment, classroom instruction, and the Next Generation Science Standards. We were joined by fellow learning progressions researcher Hannah Sevian and MSP Program Officer Jim Hamos.

–Jennifer Doherty, Post Doc

More Notes from the Field

"A observation that comes to mind is just how difficult it is to get High School students to understand the Carbon cycle. In addition to teaching Biology, I teach an Ecology class. When I ask the 11th and 12th grade ecology students (all who have had a year of Biology before) simple questions I use in biology, such as, 'Where does the mass in this chunk of fire wood come from?,' many of the students cannot correctly answer the question. Mass from gas concepts are just really difficult to get across to teenagers!"

-Tracy Landboe, Roosevelt High School, Seattle, Washington

Plant Investigation Update

Recently, we made some improvements to the Plant Investigations. We found that giving the plants a nutrient solution that provides micronutrients was very beneficial to their growth. Micronutrients were lacking in our previous trials, where we used Miracle Grow. Next year we will be distributing different and better nutrient solution, in the meantime if you are doing the Plant Unit we suggest checking with your local plant, fertilizer or hydroponics store.

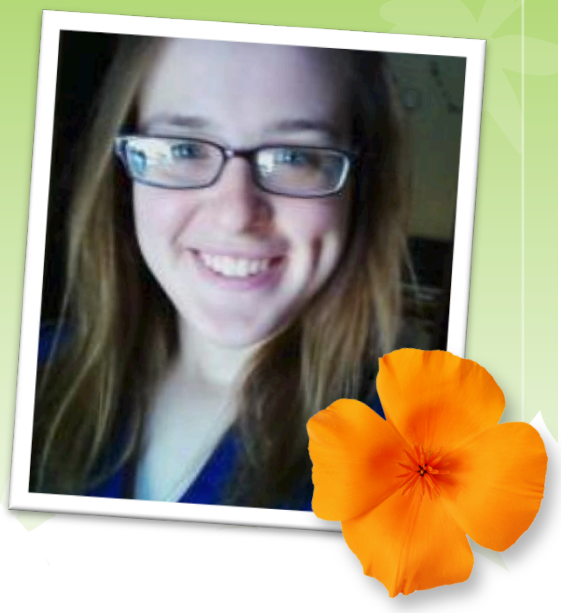
Another helpful recent discovery was that Romaine lettuce is very good at gaining dry mass. This is partially due to the small seed size compared to the large final dry mass. Also, it is easy to harvest because once dry, romaine does not crumble as easily as other plants. We are in the process of starting more trials to further test romaine's growth.

A final useful improvement that we made to the plant investigations was switching from small circular containers to slightly larger rectangular containers (about 3 x 5 inches). This allowed for less soil to be lost proportionally to the

mass of the container. Also, it permitted more room for more plants to grow and gain more biomass than they did in the smaller containers. We recently had a successful 4-week plant trial where romaine plants gained about 2.5 g of dry mass (which will be robust compared to predicted 1 g of loss of soil during student sorting of plants and soil).

-Courtney Lannen

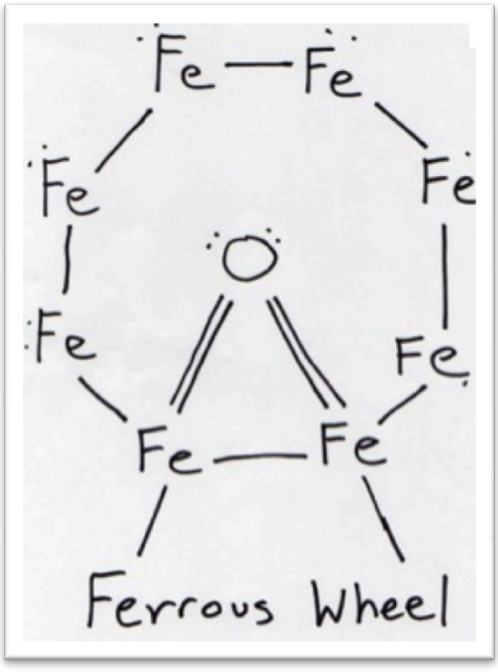
Spotlight on the Undergrad



Meet Kathryn Oleskowicz, the most recent addition to the Carbon TIME project. Kathryn is originally from Detroit and is on track to graduate from MSU in May of 2013 with a degree in special education. Kathryn spends some of her precious free hours as an undergraduate coding student responses for Carbon TIME: "I love reading the responses…when a student gives a response from left-field, it's such a challenge to understand the student's thought process." She decided to join the project because: "As an elementary school student, I was a victim of poor science curricula. Therefore, I was interested in being part of a team that tried to change science curricula for the better." After she graduates, Kathryn would like to start teaching. In preparation for this, she's made a list of things she'd like to do during her summers. The list includes becoming certified to put on fireworks shows, and working at Disney World.

Welcome, Kathryn!

Carbon TIME Comics



Important links

Carbon Time Wiki:
http://carbontime.wikispaces.com
Environmental Literacy Homepage:
http://bit.ly/xecY3e
Facebook:
www.facebook.com/groups/179507025481693/
Twitter:
@CarbonTIME

Tips from Staci

- Don't say your students' names in the interviews.
- Labeling the tapes clearly saves a lot of time. If it is an interview, include the date and student initials. If it is a class tape, indicate which unit it is from.
- Make sure students write their initials on their paper tests (try to keep them from writing out their entire name).