

**What is *Carbon TIME*?** *Carbon: Transformations in Matter and Energy (Carbon TIME)* is a set of teaching units for middle and high school science classes focusing on processes that transform matter and energy in organisms, ecosystems, and global systems: combustion, photosynthesis, cellular respiration, digestion, and biosynthesis. Students use these cellular and chemical processes to explain the functioning of organisms – plants, animals, decomposers - as well as ecological and global carbon cycling.

***Carbon TIME*** includes four units—*Systems and Scale*, *Plants, Animals*, and *Decomposers*—that examine matter and energy in flames and individual organisms. *Ecosystems* and *Human Energy Systems* focus on carbon and energy at ecosystem and global scales. The units each require about three weeks of classroom time.

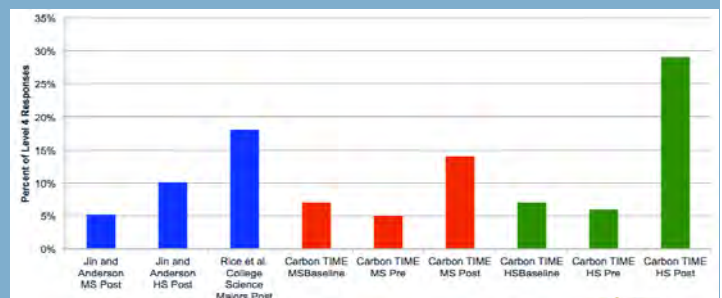
***Carbon TIME* resources include:** *Online units* that include a suite of teaching and assessment tools: formative assessments, hands-on investigations supported by videos, molecular modeling activities, animations and simulations of carbon-transforming processes and carbon cycling, posters, and graphic organizers. *Carbon TIME* also provides, professional development experiences and personal support networks for teachers that will support rigorous and responsive teaching.

**The NGSS connection:** *The Next Generation Science Standards* will require new approaches to science teaching that

are *rigorous* and *responsive*: engaging students actively in science and engineering practices and providing students with specific targeted coaching. All *Carbon TIME* units, lessons, and activities are aligned with *NGSS* practices, crosscutting concepts, and disciplinary core ideas.

**The citizenship connection:** *Carbon TIME* units prepare students to be productive and well-informed citizens as they make decisions about their personal health and consumption and as they consider public issues associated with our carbon footprints and climate change.

**How do we know students are learning?** Results from our pre/post assessments tell us that after three *Carbon TIME* units, middle school students (highest red bar) and high school students (highest green bar) show higher learning gains than students who didn't study *Carbon TIME* (blue bars), including college students (highest blue bar). All six *Carbon TIME* units come with pre/post assessments and instructional materials for all activities.



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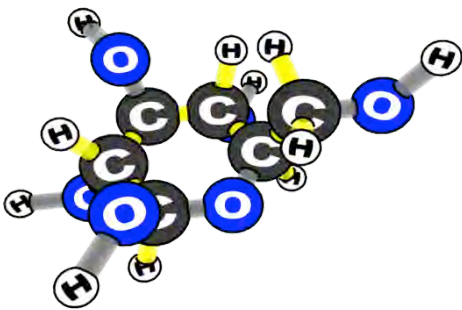
# Teaching Opportunities for 2015-2017

## Carbon TIME

Our first grant for the development of *Carbon TIME* is reaching its conclusion after three years of pilot testing. Pilot versions of the units are available now, and final versions will be available in Summer, 2015, on the BSCS website.



We have received a new grant from the National Science Foundation to continue working on this project through 2019. Our work will include revising and expanding the *Carbon TIME* units to include case studies and decision-making lessons, creating an online professional development course, and creating local support networks for teachers using *Carbon TIME*. We will have several opportunities for teachers to participate in the development process as we continue to develop and improve *Carbon TIME*.



Participating teachers will need to teach at least three *Carbon TIME* units during the 2015-16 school year and again during the 2016-17 school year. We will be collecting data to improve the effectiveness of our programs and teaching materials. Teachers will receive the following benefits:

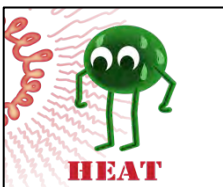
- Support in aligning *Carbon TIME* teaching with district and state assessments and policies.
- Two days (about 14 hours) of participating in online professional development experiences during the summer of 2015.
- Two days of face-to-face professional development with other teachers in your area during the summer of 2015.
- A total of six additional days of face-to-face and online professional development between September, 2015 and June, 2017.
- A \$300 mini-grant for supplies and materials
- Compensation totaling \$1200-\$1500 over two years for participation in online and face-to-face professional development
- Compensation totaling \$600 over two years for time and energy devoted to data collection



**MOTION**



**LIGHT**



**HEAT**



**CHEMICAL**

**If you are interested in participating or if you have any questions, please email project management at [envlit@msu.edu](mailto:envlit@msu.edu)**