Chemical Compounds of Climate Change

Rebecca DiSciacca, Renbrook School, 8th grade chemistry, 3-day sequence.

Introduction: Following the introduction of elements and compounds, students will be reminded of the greenhouse effect (taught in 7th grade science). In small groups of 3-4 students, they will be given a chemical compound related to climate change to research. They will become proficient in the chemical and physical properties of the compound and proceed to research its impact in climate change and connect it to combustion or ocean acidification. The groups will conclude their work by informing their classmates about the process and explaining what we can do each day to help limit our personal production of greenhouse gases.

Geographic Connections: Human-Environment Interaction: Place, Regions, and Culture

D2.Geo.5.6-8. Analyze the combinations of cultural and environmental characteristics that make places both similar to and different from other places.

Vocabulary: Global warming, climate change, greenhouse gases, greenhouse effect, methane, combustion, fossil fuels, ocean acidification

Content Standards:

CCSS.ELA-LITERACY.RST.6-8.8

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-LITERACY.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

INQUIRY ARC

1. Draw students in by viewing images and discussing previously learned knowledge about climate change and global warming.
2. Have students research a particular chemical compound related to climate change.
3. Students will discern good sources and work to find digestible content for their level.
4. Students will work together to communicate a message to the larger community about the greenhouse gas or chemical process they were researching.

Essential (Compelling) Question:

How do we inform members of our community about the chemistry of climate change and what they can do to help?

Literacy through the Content Area: Students will be instructed to find digestible information. Students must use a minimum of three sources that they understand and can communicate to others. When students encounter sources that are mediocre they will note what about the website makes it a poor source. When students find websites that challenge their understanding they can look up words they do not understand and make a decision with their group (and teacher) if the source is too complex.

Placement of Lesson within Broader Curriculum/Context: This lesson allows students to apply their chemical understanding to a relevant current event. They will practice their chemical literacy and ability to communicate information to members of our community who are not in a chemistry course. This lesson will be introduced after students are comfortable with elements and compounds and have started balancing equations. It will connect well to the unit about pH and organic chemistry unit in the spring. This lesson will help students see chemistry in the news and their own surroundings.

Learner Background: Some of the eighth graders will have prior knowledge about global warming and the greenhouse effect. Pre-assessment will include several check-in questions and then a general discussion about global warming and climate change. Students will gain understanding and use their chemical knowledge to make connections to the real world. Students have significant experience researching and presenting information to the class.

Objectives for Lesson: Students will be able to articulate their chemical understanding of a process associated with global warming. They will present the information to the class and create a plan to educate the greater community.

Integration of 21st century skills: Students will be working in small groups - collaborating about sources and research. They will be creating Google slides to present to their classmates and Google drawing to advertise their specific advice to the community. They will be using critical thinking to solve real world problems. Inherently, students will practicing effective communication throughout the project and using technology to research, present and design materials.

Assessment: The culmination of student research will be a Google slide presentation to our class. They will have a plan for how to advertise their campaign to the larger school community. Perhaps designing signs, or a short film (pending time).

Pre-Assessment Questions - What is global warming? What is climate change? What human activities contribute to climate change?

Summative Assessment - This is an inquiry lesson with a summative assessment - students will be evaluated using a rubric designed for this project (see attached). It will evaluate their ability to work with the group, ability to find helpful resources, presentation skills, and ability to communicate scientific information.

Materials/Resources: Access to devices and internet, library, prototype of a good flyer.

Lesson Development/Instructional Strategies

DAY 1

1. Pre-Assessment (5 minutes): students will be given a small piece of paper. Students will be asked what is global warming? How do humans contribute to climate change?
2. Discussion/brainstorm (15 minutes): The whole class will discuss global warming and distinguish between global warming and climate change. We will spend time looking at images of climate change. Students will discuss the human activities that contribute to climate change. Consider showing map of greenhouse gas emissions in CT http://ghgdata.epa.gov/ghgp/main.do.
3. Students will be organized into four groups. Each group will receive a compound to research. Topics include carbon dioxide, water vapor, methane and nitrous oxide as each pertain to combustion and ocean acidification. They will conclude the class by organizing a GoogleDoc for their notes. Homework will be to spend about 20 minutes doing research about their compound and how it pertains to climate change.

DAY 2

1. Students will report to their group about information they found the night before. They will proceed to collect a bit more information and then organize a short Google slides presentation about how their compound or process is related to climate change.
2. One slide will be allocated to how human activities contribute to the process or production of the greenhouse gas. Students will develop a plan for how to educate members of our community and help the school lessen its carbon footprint.
3. Students will finalize slides and make sure each student has a slide to speak about tomorrow for the presentation. Homework: practice presenting slides.

DAY 3

1. Give students 5 minutes to check in with each other prior to their presentations.
2. Start presentations (5 minutes to present, 5 minutes for questions)
3. Homework: reflection question - what do you think the most critical human activity to prevent or slow in terms of climate change?

DAYS 4 & 5 (if schedule permits)

1. Show students examples of powerful flyer campaigns. Ask them to brainstorm what works well.
2. Students then create their own sign (digitally) OR installation (show example) - to send a message to the greater school community. Ideally, this would coincide with an Earth Day celebration.

Students Needing Differentiated Instruction:

Differentiated instruction - for students with varied abilities provide potential sources for each topic. Have examples of what a “good slide” looks like for their presentation and allow for more time to complete the project.

Enrichment - for students who are ready for more challenge they can design multiple advertising campaigns and write letters to members of our community (school and beyond) about the importance of educating people about climate change.