

EMPOWERING SIXTH-GRADE STUDENTS THROUGH A CLIMATE CHANGE Lesson

BY RENEE BELISLE

Climate change is a pertinent and important topic in the science classroom and student understanding of the drivers and impacts of climate change should be developed. It is also crucially important that students understand that they can help mitigate climate change, helping them avoid an entirely gloom-and-doom perspective. It is recommended that this lesson be used as an introduction to climate change as part of a storyline focusing on the anchoring question, “Can a single human impact the planet’s climate?”

To promote empowerment-based climate change education, this lesson begins with basic definitions of *global warming* and *climate change*, then asks students to calculate their carbon footprint and identify ways that they can affect climate change. The significance of this lesson is in its empowerment-driven approach to climate change. If students are only exposed to the dangers of climate





change, they can easily develop a sense of hopelessness, which is correlated with a reduction in conservation actions (Swaisgood and Sheppard 2010). Here, students are introduced to climate change while exploring reasonable and effective ways that they themselves can impact the issue.

Climate change can be a difficult topic for teachers to broach—and not simply because of political pressure. Difficulty can also arise because the knowledge on climate change is relatively new, while many school districts' curricula are relatively old. Climate change is not only crosscurricular; its novelty as a scientific concept also challenges teachers as they try to develop back-

CONTENT AREA

Earth science

GRADE LEVEL

8

BIG IDEA/UNIT

Climate change

ESSENTIAL PRE-EXISTING KNOWLEDGE

Difference between climate and weather; that humans impact the planet

TIME REQUIRED

Two to three 50-minute lessons

COST

None

SAFETY

No precautions needed

ground knowledge (Oversby 2015). Teachers surveyed in both Florida and Puerto Rico held the same erroneous views about climate change as the public, such as that the primary cause of climate change was the depletion of the ozone layer (Oversby 2015). The need to develop both confidence and up-to-date curriculum for educators is important for climate change education. With the reality that climate change pedagogy will need several years to catch up, the educational content in the presented lesson is very basic, and the lesson provides all the background knowledge necessary for the teacher.

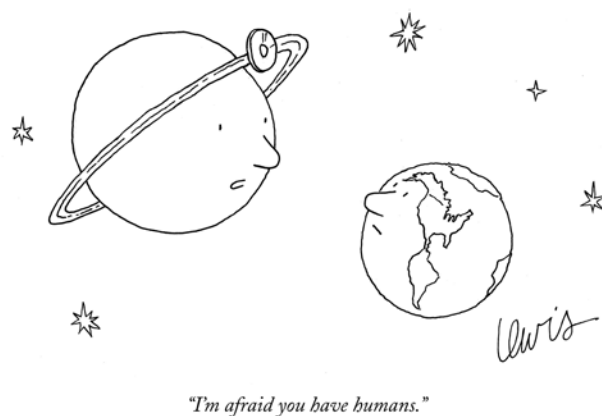
Audience of focus

The audience of focus for this lesson was sixth-grade students in a middle school serving a largely English language learner (ELL) population. The goal of this lesson was to introduce some basic background information and the terminology of climate change, and then work to gauge students' feelings of empowerment to affect climate change. Middle school students do not have access to a significant number of choices that adults have in combating climate change—they cannot vote or drive, and it is more challenging for them to organize protests or boycott entities that negatively impact the planet. The goal of the lesson was to illustrate to students that even at 11 and 12 years old, they have the ability to impact the climate in a positive way through their personal decisions.

Engage

To hook students and engage them in oral discussion, they are shown a picture of a “doctor” planet solemnly telling Earth, “I’m afraid you have humans” (Figure 1). Students are asked why the doctor planet would say this. Students are asked to participate in a think-write-share, as they practice talking about the Earth both orally and in writing. The discussion about human implications should lead to the discussion of the second question, posed to the whole class: “How have humans changed the planet—in positive, negative, or neutral ways?” Allow a think-pair-share to give students with more processing needs time to come up

FIGURE 1: Cartoon for lesson hook



with an idea for each category. This discussion provides a chance for students to understand that while humans have had negative impacts, there are positive actions that humans can take as well. Constant negativity around human impact can cause students (and adults) to develop a fatalistic view of the future (Swaigood and Sheppard 2010). It is important and powerful to acknowledge that while many human actions have been negative, there are positive ways humans are impacting Earth, and those can help mitigate or slow the impacts of climate change.

Explore

Using the website The Greens (see Resources), students were able to calculate their carbon footprint with a series of guided, illustrated questions, asking about their daily habits (such as how often they ride in a car, their dietary choices, and what chores their family performs). As they move through the website, students can make pledges to reduce their carbon footprint along the way. The website's carbon footprint calculator asks questions in student-friendly terms, such as how many people live in their houses, how often they do laundry, their typical diet, and so on. At the end of the simulation, the website generates a carbon footprint for the student, compares it to the carbon footprint of the average American, and to the average carbon footprint of a same-aged student in different countries. The carbon footprint helps

show students their impact on the planet compared to the global average and how many planets it would take to support their lifestyle if everyone lived like them. Students can also compare other countries to the global average (Figures 2 and 3).

Students can use tablets or smartphones to access the website. If possible, students can use a one-to-one classroom technology device with a read-aloud function. Approximately a third of the ELL students in the classroom chose to use this feature, using headphones so as not to disturb their classmates. This feature allowed them to both read and hear the questions, and it provided steady pacing. In a classroom without this technology, the teacher can also pull a small group of students with whom to read the questions aloud, or go through each question as a class, having student volunteers read each question.

Explain

To build a better understanding of global warming, climate change, and carbon footprints, the interactive reading was used to introduce the basic definitions of these concepts, with supporting visuals for struggling readers, ELL students, and visual learners (see Online Supplemental Materials). The reading also discussed some of the main causes of climate change, from which students could begin to identify some of the behaviors they engage in that could contribute to climate change. ELL students were given the same reading, simply broken into paragraphs (one per page), with numbered lines. All students were given the option to complete the reading in pairs, alternating who reads each paragraph, or reading along with the teacher in the front of the room.

Each paragraph of the reading concludes with a question meant to elicit new thinking based on

FIGURE 2: Author's results compared to national average

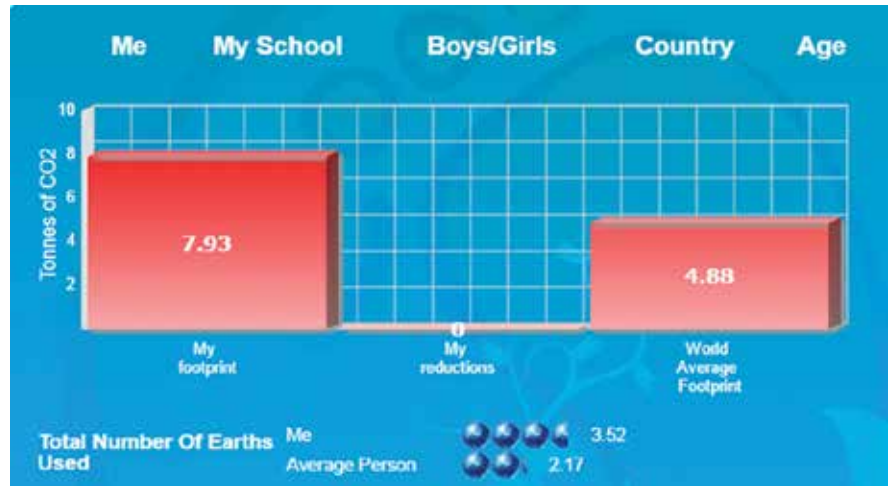
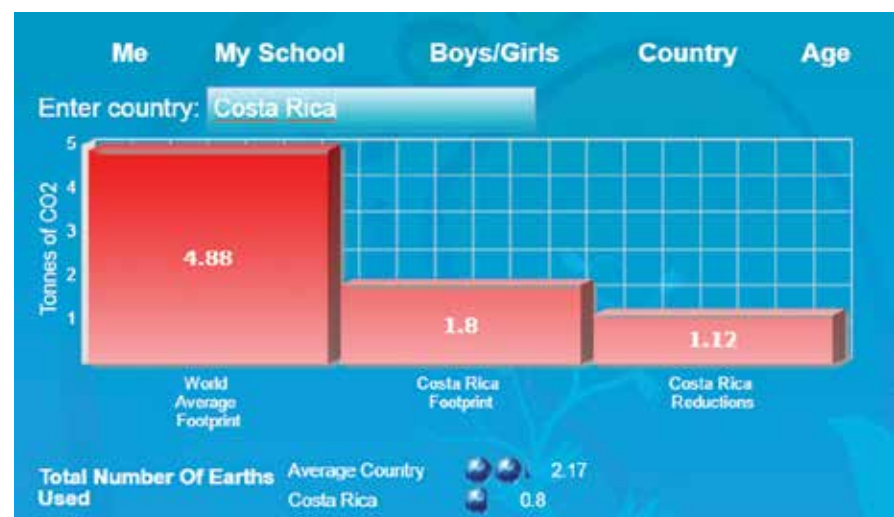


FIGURE 3: Costa Rica footprint compared to global average



the paragraph, rather than serve as a simple recitation of an aspect of the article. In pairs, students answered each question after each paragraph, as they did with the teacher. An extension article (see Resources) was provided to students who finished early, which presented the claims a climate change denier may make and the rebuttals for each of them. Students then created a one-panel cartoon where character A asks about one of the claims in the article and character B respectfully explains why it is untrue using scientific claims.

Extend

Students were asked to write down what they thought their two biggest contributions to their carbon footprints were and their reasoning for such. They were asked to decide what a reasonable change would be for that decision, with a class discussion about what was “reasonable.” For example, many students believed that driving in cars was a major contributor to climate change. Instead of pledging to never drive again, the class was asked to brainstorm what a reasonable modification would be—for example, walking to all locations that require less than a five-minute car ride. Afterward, students were asked to go back through the simulation again, and to explore their results with their behavioral change. Students were asked to record the change in their carbon footprint, and reflect if their proposed change would allow them to significantly reduce their carbon footprint.

Evaluate

Students were asked to respond to the following prompts:

1. Read the following proposed methods to reduce a carbon footprint. Respond to the questions that follow.
 - a. Require that schools do not serve any meat in the cafeterias.

Would this be a reasonable change? Support your answer with your experiences and critical thinking. Would this affect students’ carbon footprints? Explain how (or why not) and support your answer using evidence from the simulation.

Example of a student response: *This would not be a reasonable change. This is too hard to do. A lot of students like meat and a lot of kids need meat to grow. It would help your carbon footprint, though. Eating meat is one of the biggest things that adds to your carbon footprint. Kids that did not eat meat had much lower carbon footprints than kids who did eat meat. So it's a good thing for your carbon footprint, but because it's not reasonable, people probably wouldn't do it.*

- b. Ask all students to pick up one piece of litter from the grass.

Would this be a reasonable change? Support your answer with your experiences and critical thinking. Would this affect students’ carbon footprints? Explain how (or why not) and support your answer using evidence from the simulation.

Example of a student response: *This is reasonable but would not do anything about climate change. Climate change happens because of carbon emissions. Littering makes the planet dirty but it doesn't make carbon dioxide. All of the stuff in the website asked about things people do that make carbon dioxide. This is reasonable but won't change climate change.*

2. Describe one reasonable change you could make in your life which would reduce your carbon footprint. Explain why this is reasonable for you and how this would affect your carbon footprint (use evidence from the simulation).

Sample student response: *I think that on Fridays, I will ride my bike to school instead of getting a ride. I think this is reasonable because it is only one day a week. And when it's Friday, I am excited about the weekend and don't mind riding my bike because I have extra energy. This would help my carbon footprint because riding in cars is a big part of my carbon footprint. When I did the website again and said I didn't drive at all, my carbon footprint went way down.*

Students were asked to share their responses to question 2 in a small group setting (3–5 students). This helped all students practice their comfort with talking about scientific issues in a less public setting than in the larger classroom. After they presented their ideas, the group asked two questions (either to challenge or clarify the change the student was proposing) and asked to vote on if they considered this change reasonable.

Another potential assessment could include holding a Climate Change Summit in which students use research to support their claims for reasonable changes people can make.

Discussion/reflection

This lesson empowers students by creating an understanding that they have the ability to positively impact climate change before they learn more about its consequences. Future lessons could delve deeper into the ways that humans affect climate, historical fluctuations

in climates compared to the past 100 years, future predictions, and arguments raised against climate change.

Climate change remains a reality. Without education, there can be no change in behavior. The teaching of climate change education is imperative, and it can be introduced successfully even in a short lesson to early middle school students. ●

REFERENCES

Oversby, J. 2015. Teachers' learning about climate change education. *Procedia - Social and Behavioral Sciences* 167: 23–27.

Swaigood, R.R., and J.K. Sheppard. 2010. The culture of conservation biologists: Show me the hope! *BioScience* 60 [8]: 626–30.

RESOURCES

The Greens—www.meetthegreens.org/features/carbon-calculator.html

Top ten global warming “skeptical” arguments answered—<http://bit.ly/2uGx9V8>

ONLINE SUPPLEMENTAL MATERIALS

Interactive reading—www.nsta.org/scope1710

Connecting to the Next Generation Science Standards (NGSS Lead States 2013)

- The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities.
- The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below.

Standard

MS-ESS3-5: Earth and Human Activity
www.nextgenscience.org/pe/ms-ess3-5-earth-and-human-activity

Performance Expectation

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

DIMENSIONS	CLASSROOM CONNECTIONS
Science and Engineering Practice	
Developing and Using Models	Students use an online simulation to evaluate the impact of multiple types of lifestyles
Disciplinary Core Idea	
ESS3.C: Human Impacts on Earth Systems <ul style="list-style-type: none"> • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts [negative and positive] for different living things. 	Students use a simulation to evaluate how changes in their own activities can reduce their carbon footprint.
Crosscutting Concept	
Cause and Effect	Students record a proposed change in their lifestyle and evaluate the impact their change will have on their carbon footprint.

Renee Belisle (renee_belisle@dpsk12.org) is the grades 3–8 science curriculum specialist at Denver Public Schools in Denver, Colorado.