

In this lesson students learn about the effects of different diets and foods on our Climate Crisis and how to make positive changes

NOTE this is a Climate Solutions Activity— after covering some basic science

Guiding Questions

1. How does our diet affect the atmosphere?
2. How can we make improvements?

Grade Level: 5-8

Next Generation Science Standards

Disciplinary Core Ideas:

MS - ESS3-D Global Climate Change (Connections to ESS 3-C Human Impacts, ESS2-D Weather & Climate)

MS - PS1.A Structure and Properties of Matter

MS - LS2.B Cycle of Matter and Energy Transfer in Ecosystems

Science and Engineering Practices: 1, 3, 4, 5 ,6 ,7 ,8

Crosscutting Concepts: 1, 2, 3, 4, 5,7

5E's see below

Teacher Overview

Growing food results in emissions of carbon dioxide (from deforestation, farm machinery, fertilizer production), methane (from cow burps and rice production), and nitrous oxide (from fertilizer applications). Nitrous oxide and methane are more powerful greenhouse gases than carbon dioxide. The different types of greenhouse gases are represented in the food cubes as carbon dioxide equivalents.

As students pick up each cube, they will notice that animal products have a greater carbon footprint than plants. One reason for this is that animals require food in the form of plants (grains, corn, and other feed which also have a carbon footprint!). This adds to the animal carbon footprint. It is interesting that 75% of all farmland used to grow food is used to raise animals or produce animal feed.

The students will quickly notice that beef is the heaviest cube. Cattle are ruminants, with special multi-chambered stomachs that allow them to digest grass, but ruminants also release a lot of methane (through burps), which is a greenhouse gas 35 times worse for the climate than carbon dioxide. Chickens and Pigs are not ruminants so they don't release very much methane. Beef has a carbon footprint 5x greater than chicken (20x greater than beans).

Materials:

Introduction: samples of 2.5 ounces of some of the real foods represented on the cubes: egg, potatoes, cheese, for example. Food cubes: see separate sheet for instructions on how to make them.

For students: one or two sets of food cubes; four or more electronic balances; printed student worksheets or Chrome books or equivalent.

Engage/Explore: Food Weight

The food weight activity will really engage the students – actually holding the different cubes is much more real than just looking at numbers. Start by asking a student to come pick up spinach and beef cubes. Then have another student pick-up beans and cheese. They will be amazed and the rest of the class will be interested.



The class activity can be organized differently depending on how many scales are available. The Beef, Cheese and Pork might be TOO HEAVY for some scales, so check the limits first.

Pork ~ 600g, Cheese~830g, Beef ~2000g: a home cooking scale might work for these.





With Just One Scale

Each group of three students will designate one person to select a Food Cube and weigh it at the front. The student enters the data into the teacher's computer so it can be projected. The student then brings the cube back to their group and each student enters the data on their data table. After everyone at the table has felt the weight, they pass it to the next group. Repeat this until all the cubes are weighed and all the groups get to weigh a cube.

With Several Scales

If you have enough scales for each group to get one, you can give each group a few cubes. They weigh the cubes and enter weight into the data table. Everyone gets to hold each one and then they pass the cubes to the next group. Each group will weigh every cube.

Engage/Explain

Study your data table. Fill the out the questions 1 and 2. Then discuss as a class. Why do you think some food produces more carbon dioxide than others?

Watch the Movie: "Eat Less Meat" (1:30) <https://www.youtube.com/watch?v=uh-tECeaMCA>

One way to do this might be to play it straight through and THEN go over the vocabulary terms. And then play it again with lots of pauses so they can answer the questions. Don't be afraid to talk about the fact that cow burps are just as bad as cow farts. Using these terms will help them remember the lesson.

Explain/Elaborate/Evaluate

Review the Data Table

Discuss how the spinach only needs sunlight, water and CO₂ from the air. On the other hand, any animal product involves growing stuff for the animals to eat and only a small fraction ends up as meat. There is also more water, land, transportation etc. involved in raising animals.

Give the students time to discuss question 4 on their worksheet (the percent of greenhouse gas emissions livestock produce) with their group. This is perhaps the MOST important part of the whole lesson.

You can go back to the food cubes and get someone to hold Beef and Chicken.

Listen to students' responses and ensure them that even small steps will help: big changes take more time.

Written by Pauline Seales.

This lesson uses resources from [Carbon Café lesson plan](#) created by California Academy of Sciences

presented at CSTA in San Jose, Ca in November 2019:

<https://www.calacademy.org/educators/lesson-plans/carbon-cafe>

