



EMPLOYEE ACTIVITY | GRADE RANGE: 6–8

Carbon Footprints

OBJECTIVES

Students will:

- Define carbon footprint.
- Make connections between their own actions and the condition of the environment.
- Communicate ideas for improving carbon footprints to peers and adults.

OVERVIEW

Students will determine their own carbon footprint by taking a survey and tabulating their results to determine their own personal impact on the environment. They will analyze their own responses to see how they can reduce their carbon emissions to lower their personal environmental impact.

TIMING

45–60 minutes

MATERIALS NEEDED

- Pencils, one per student
- **Carbon Footprint** student handout, one per student
- **Carbon Footprint Reflection** student handout, one per student

VOLUNTEER PREP

1. Read through the activity instructions to familiarize yourself with the content. Note that timing guidance is provided as a recommendation, but each situation will be unique. Use the Lesson At-a-Glance below to determine how long you plan to spend on each section.
2. Prepare all materials before your session.
3. Have the **Essential Question** written largely or projected on the board before students arrive.

LESSON AT-A-GLANCE

Section	Activity	Approximate Time in a 45-minute Session	Approximate Time in a 60-minute Session
Engage	Volunteer introductions and Essential Question	6–8 minutes	6–8 minutes
Learn	Carbon Footprint	7–10 minutes	9–15 minutes
Discuss	Carbon Footprints	15–20 minutes	20–25 minutes
Challenge	Carbon Footprint Reflection	5–8 minutes	7–10 minutes
Closing	Making Change	2–3 minutes	3–5 minutes

PROCEDURE

Engage

1. Take **2–3 minutes** to introduce yourself to the class. Explain that you are here on behalf of Trane Technologies, and you are excited to help teach them about sustainability. Briefly explain your role at Trane Technologies and one major step you have taken to decrease your carbon footprint or have a more positive effect on the environment.
2. For approximately **4–5 minutes**, engage students in the upcoming lesson by asking the following **Essential Question**. This question is intended to get students thinking about their upcoming learning experience and can be used to encourage discussion and help students contextualize the topic focus while leaning into prior knowledge or experiences.
 - How can I have a positive impact on the environment?

Learn

3. Explain to students that one thing that increases positive impact on the environment, as well as the topic of today’s session, is analyzing and decreasing one’s *carbon footprint*. You may want to write this term on the board for reference.
4. Explain to students that a carbon footprint is the total amount of greenhouse gas emissions, expressed as carbon dioxide (CO₂), caused by an individual and their actions and energy needs. Currently, the average carbon footprint for a person living in the United States is 16 tons, one of the highest rates in the world!¹

¹ <https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/>

5. Carbon footprints, or more specifically the CO₂ emissions they represent, have a negative effect on the environment. They are the main cause for human-induced climate change, air pollution, acid rain, and melting glaciers.²
6. Emphasize that the purpose of understanding what a carbon footprint is and how it is calculated is to determine the major sources of CO₂ emissions in the hopes of finding ways to decrease them. Decreasing CO₂ emissions will help them have a positive impact on the environment.
7. Inform students that the largest contributors to carbon footprints are activities that we all participate in daily. For example, transportation, heating and cooling, showering, watching TV, and even eating! The trick is understanding your own actions and limiting them to keep your own personal footprint in a manageable range.

Discuss

8. Distribute one **Carbon Footprint** student handout to each student. Explain that in the left column are actions or things that will increase a person's carbon footprint, and the right column has actions or things that will decrease a person's carbon footprint and therefore have a more positive impact on the environment.
9. Reinforce that the right column is the goal, but not everything on the list is always under our control. Emphasize that they should each try to do the best they can and encourage others to do the same so that larger changes can be made.
10. After students have reviewed the two lists, facilitate a discussion for 5–10 minutes using questions like these below:
 - Why might it be challenging to have a low carbon footprint? Explain.
 - What things on the list can you control? Which might be out of your control?
 - Are there things on the green list that you or your family already do?
 - Are there areas where you and your family might be able to make a positive impact? How?
 - What responsibilities do individuals, companies, and policy makers have for helping to reduce our collective carbon footprint?
11. Remind students that the global average is 5.29 tons, but the American average is 16 tons! Keeping that in mind and considering the list, ask 1–2 volunteers to offer what conclusions can be drawn. (Anticipated responses might include, "American's global footprints are way too high," "We need to change how we live," "We need to figure out ways to make this better," etc.)

² <https://impactfulninja/why-is-a-carbon-footprint-bad-for-the-environment/>

Challenge

12. Emphasize again that while everyone, even children, can have a positive impact on the environment, it is not always within their control what decisions are made for the family or household.
13. Asking them to keep that in mind, direct them to go through the lists again, this time specifically looking for areas they think they can make a difference. Provide examples where needed (i.e., bring leftovers to school for lunch instead of throwing them away, purchasing reusable items for the home.).
14. Pass out the **Carbon Footprint Reflection** handout to each student. Encourage students to determine three actions that they feel comfortable taking that could lower their carbon footprint and have a positive impact on the environment.
15. Next, have students review the list to determine which of the items are government, community, or policy decisions that impact individual's or family's ability to implement. Start by having students work on their own to consider items that have barriers to implement for individuals or families. Examples might include lack of access to local farmer's markets, the price of electric cars, or lack of public transportation routes near their home.
16. Next, ask each student to select three items from the list and brainstorm creative solutions to remove those barriers and make decreasing carbon footprints more accessible to all people. As a class, invite students to share out their creative ways these barriers could be removed.
17. As students share, consider the following prompts as discussion extenders:
 - What ideas might impact individuals or families in your own community the most?
 - Which ones do you feel most strongly about?
 - While you can make choices to help reduce your carbon footprint, how could governments, businesses, or policy makers help make bigger changes?

Closing

18. Before you leave, thank the classroom teacher and students for allowing you to join them, and encourage them to apply what they have learned about how to have a more positive impact on the environment by discussing their reflection with their families.

EXTENSION IDEAS FOR EDUCATORS

- Find an online carbon footprint calculator for businesses and complete it as a class for your school. What recommendations can you make to help the school have a more positive impact on the environment?
- Using a service-learning approach, have students take what they have learned into the community to educate, encourage, and empower people to improve their community's carbon footprint and have a more positive effect on the environment.
- Have students create and run a fundraising campaign to try to plant the number of trees needed to offset their carbon footprint.

NATIONAL CONTENT STANDARDS

National Science Standards

- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Common Core State Standards for Math

Statistics and Probability:

- SPA.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- SPA.2: Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Science and Engineering Practices

- Asking Questions and Defining Problems
- Analyzing and Interpreting Data

SOURCES

- <https://8billiontrees.com/carbon-calculator/>

Increase Carbon Footprint	Decrease Carbon Footprint
Old lightbulbs and appliances	“Energy Star” products
Coal and natural gas appliances	Electric appliances
Using large amounts of hot water	Washing clothes in cold water or taking shorter showers
Heating and cooling unused spaces	Closing vents in unused rooms
Driving everywhere	Walking, riding bike, carpooling, or using public transportation
Driving large vehicles	Driving electric or hybrid vehicles
Flying in an airplane often	
Buying or replacing items often	Reusing or fixing items
Using disposable items	Using reusable items
Buying new clothes often or wearing “fast fashion”	Wearing clothes until you outgrow them
Eating meat, especially beef, every day	“Meatless Mondays” or more days without meat
Eating out at restaurants often	Making meals at home
Wasting food or throwing away leftovers	Eating and using leftover food
	Shopping at local farmers’ markets
	Planting a garden or trees

Considering the Carbon Footprint list, how could I lower my footprint and increase my positive impact on the environment:

1. _____

2. _____

3. _____



Next, select three items from the list and brainstorm creative solutions to remove barriers and make decreasing carbon footprints more accessible to all.

4. _____

5. _____

6. _____

