Carbon Footprint-Sustainability

Content Area: **Science**
Course(s): **Science**
Time Period: **April**
Length: **2 weeks**
Status: **Published**

Unit overview

Students calculate their carbon footprints by answering questions about their everyday lifestyle choices. Then they engineer plans to reduce them. Students learn about their personal impacts on global climate change and how they can help the environment.

Enduring Understandings

After this lesson, students should be able to:

- Define a carbon footprint.
- Calculate their personal carbon footprint.
- List several ways to reduce their carbon footprints and engineer a plan.
- Describe why it is important to have as small a footprint as possible.

Essential Questions

1. What is a carbon footprint?
2. How can you reduce your personal carbon footprint?
3. why is it important to have as small a carbon footprint as possible?

Instructional Strategies and Learning Activities

Activities:

1. Read aloud and discuss the article, Talking to your Grownups About Your Carbon Footprint (attached).
2. Watch short video clip explaining the carbon footprint in simple terms: https://www.youtube.com/watch?v=8q7_aV8eLUE

3. Each student will answer questions about their lifestyle to help calculate their own carbon footprint. They will use this form:

https://www.teachengineering.org/content/cub_/lessons/cub_whatkindoffootprint/cub_footprint_lesson01_worksheet_v3_tedl_dwc_new.pdf

4)After calculating their footprint, they will come up with ways that they can reduce it.

5) Each student will receive a handout with the outline of a footprint in it (example attached). They will decorate the footprint with all the ways they can reduce their carbon footprint.

Extension

Design a model of an eco-friendly home using the ideas you came up with to reduce your carbon footprint. Use recycled materials for your project. Watch the video for inspiration.

https://www.youtube.com/watch?v=nW59fn6vwRc

Differentiation

- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.

- **Definitions of Differentiation Components**:

    - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
    - Process – how the student will acquire the content information.
    - Product – how the student will demonstrate understanding of the content.
    - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

- **Articles offered at different reading level**

- **Calculators provided to calculate footprints**
- **Option to draw pictures or use words on footprints**
- **Check list provided for project organization**

Modifications and Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

DRA

Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

Pre-Lesson Assessment

Warm-up: Ask students if they can define the following terms: greenhouse gas, carbon footprint, climate change, emission.

Questions: Have students come up with questions to ask each other about global warming (i.e., what factors have caused the rise in global temperatures over the past century?). After the lesson, have students answer the

questions.

Post-Introduction Assessment

Worksheet: Have students complete the carbon footprint worksheet. Review their answers to gauge their comprehension of the subject. Are students able to accurately identify the ways they create or reduce emissions? Are they able to identify possible areas of improvement? Review with students exactly how the activities on the worksheet add greenhouse gas to the atmosphere.

Post-Lesson Assessment

Engineering Design: Ask students to define a carbon footprint. Ask them to create individual designs (footprint activity) that help to reduce their carbon footprints. Design a model of an eco-friendly home.

Name: _____ Date: _____

RUBRIC

	Level 1	Level 2	Level 3	Level 4
House Design (Sustainable Design Features)	House design does not include eco-friendly features	House design includes one or two eco-friendly features	House design includes three or four eco-friendly feature	House design includes four or more eco-friendly features
Eco-friendly Invention **BONUS	No invention is included in the final product	Invention does not solve a problem	Invention solves a problem but could use more detail	Invention is well thought out and solves an important problem
Labels	Labels are not included	Model is missing most labels	Model has some labels	Model is fully labelled
Carbon Footprint Packet/Footprint	Packet and footprint are missing	One of the two pieces are missing (packet or footprint)	Both parts are included, but incomplete	Both parts are completed thoroughly
Spelling	contain several spelling errors	contain some spelling errors	contain minimal errors	contain no spelling errors

Comments:

_____

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_____

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Instructional Materials

1. https://www.youtube.com/watch?v=8q7_aV8eLUE

2. https://www.teachengineering.org/content/cub_/lessons/cub_whatkindoffootprint/cub_footprint_lesson01_worksheet_v3_tedl_dwc_new.pdf
3. https://www.youtube.com/watch?v=nW59fn6vwRc
4.

Talking to your grown-ups about your carbon footprint



You can learn a lot from grownups, but sometimes they can learn a lot from you, too! What's a carbon footprint, and how can you make yours smaller? Read on to find out how to reduce your carbon footprint then share what you've learned with your grownups so they can change their habits too.

What's carbon, anyway?



Coal mine in Poland.

Carbon dioxide (or CO_2) is the waste material that comes from burning fossil fuels like oil, gas and coal. Too much carbon dioxide is bad for the environment — when it builds up in our air, it acts like an invisible blanket and traps too much heat from the sun, which part of what is causing climate change. Climate change is a term we use when we talk about the fact that the earth is warming up too much, too quickly.

Because the earth is warming up too quickly, we're seeing extreme and dangerous weather conditions around the world, and all kinds of plants and animals are being put in danger.

What is a carbon footprint?



Students in Jambi, Indonesia go home early due to smog.

A carbon footprint isn’t an actual print you make with your feet but is more like a measurement of how much carbon dioxide you create by your day-to-day human activities. The more carbon dioxide you create, the bigger your carbon footprint is. There are lots of little ways that we make our carbon footprints bigger on a daily basis that we don’t even realize.

Here are five things that have an effect on your carbon footprint:

1. How Much Energy You Use



A wind farm generates electricity in Alberta.

Electricity we use for household items like fridges, laundry machines, TVs, computers, lights, heaters and so on can use a lot of energy which increases the size of your carbon footprint.

How you can help:

- Turn off the lights when you're not using them.
- Turn off or unplug appliances when they are not in use.
- Use energy-saving light bulbs.
- Use renewable energy like solar, wind power or geothermal heat.

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2. How Much Water You Use



When at home, ask a grownup not to run the dishwasher or laundry machine until it's full.

Using less water is a great way to make your carbon footprint smaller. It takes energy to get clean water to your house, so when you use less water, you use less energy! Plus, you get the added bonus of not wasting a precious resource.

How you can help:

- Take short showers instead of baths.
- Turn off the water while brushing your teeth.
- Avoid bottled water — remember our post about single use plastics?

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3. How Much Waste You Create



Plastic waste used and collected over one week’s time.

We humans make a lot of waste. Think about all the energy that goes into making garbage! First, there was the energy use and transport whatever you've thrown away, then there's the energy needed to transport it to a landfill where it sits taking up valuable land space!

How you can help:

- Buy things that don't come with too much packaging.
- Re-use things as much as you can (take care of your toys and clothes so they'll last longer!).
- Recycle whenever possible.

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4. The Kind of Food You Eat



Eating less meat will help reduce the impact on the environment.

Food production and transportation of food creates a massive carbon footprint, but foods like red meat and cheese are especially harmful because of farming practices around the world. (It takes a lot of energy and land to keep animals!)

How you can help:

- Eat less meat and cheese.
- Eat foods that come from farms close to where you live instead of foods that come from far away countries.

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5. How You Get Around



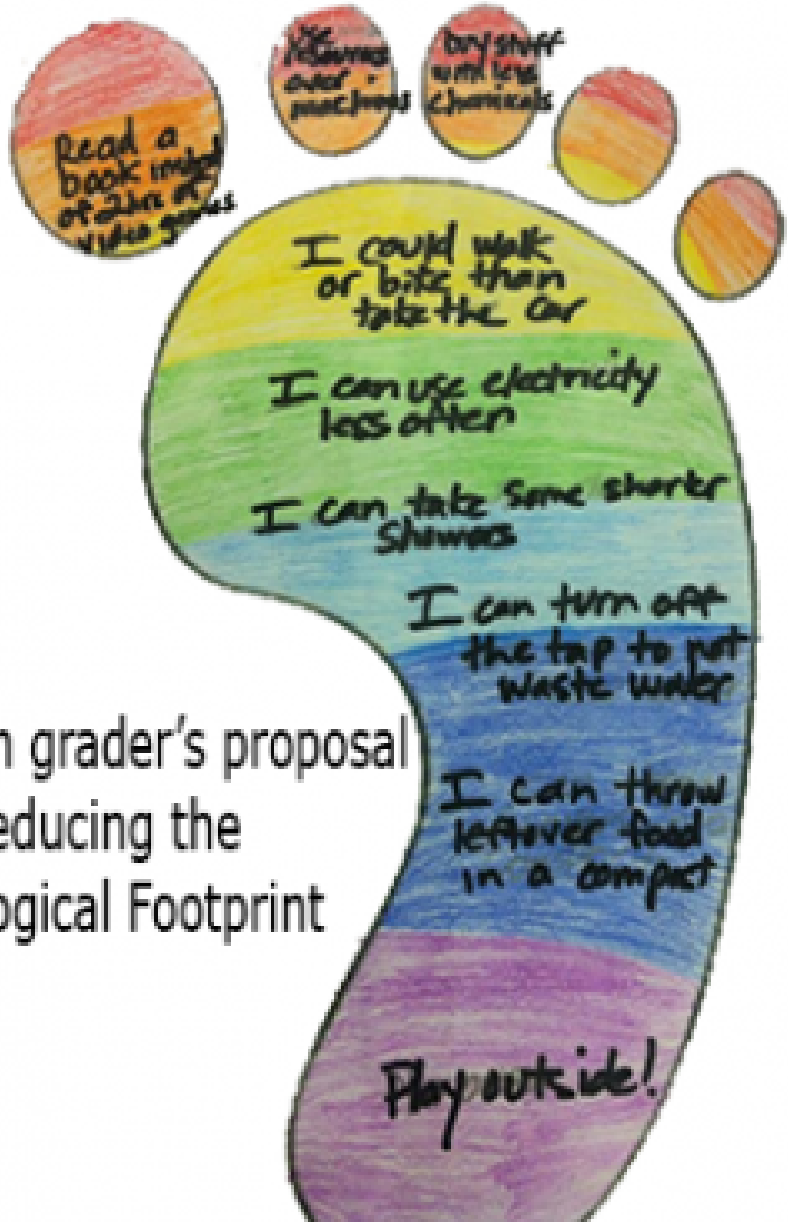
According to StatsCan, global road transportation is responsible for 74% of global CO_2 emissions.

Planes, buses, cars and trucks all use gasoline to power them and that creates a lot of carbon dioxide.

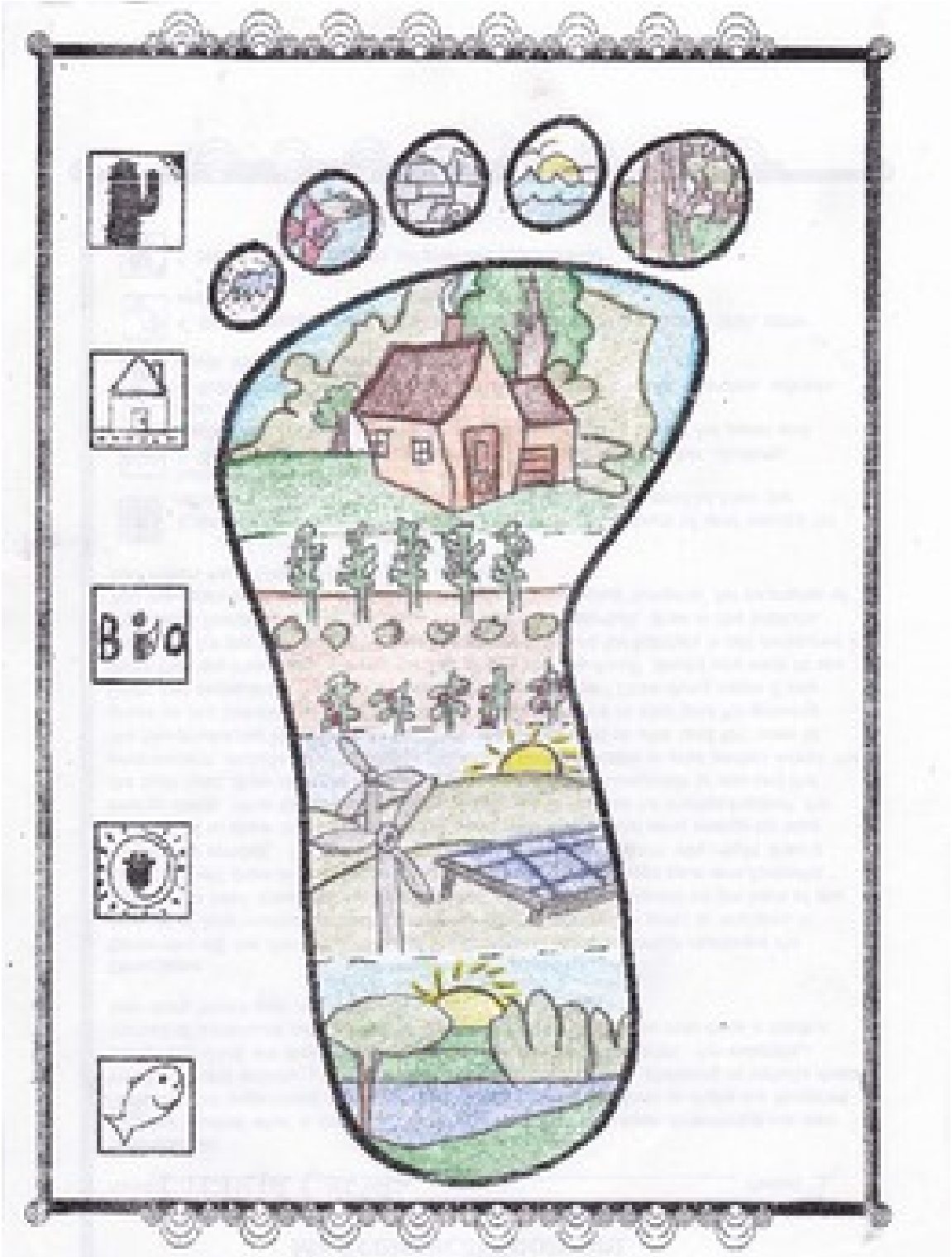
How you can help:

- Instead of getting in a car or bus, try cycling to school or walking when where you're going isn't too far away.

If we can all make these small changes every day, it can make a huge impact on lowering our carbon footprints!



A 7th grader's proposal on reducing the Ecological Footprint


Bio

Standards

9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issues.
4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.