Lesson plan 3
How big is your carbon footprint?

Learning intention or WALT

Understand the personal impact an individual has on climate change.

Success criteria

- I can explain what a carbon footprint is
- I can use mathematics to estimate the carbon dioxide emissions from a car journey to school
- I can explain why reducing carbon dioxide emissions is so important

Estimated time – 55 minutes

Key words

Environment • Commute • Carbon footprint • Whakapapa (family history) • Kaitiakitanga Guardianship • Environmental conservation • Restoration • Sustainability • Generation Tāngata (People) • Whenua (Land)

Learning experience

Class discussion and video 10 minutes

Introduction and what is a carbon footprint?

1. Discuss students' pledges (from Lesson 2), what have they done? Ask students what they remember from the previous lesson: *Last time we learned about how climate change is changing the world.* Ask students:

   What is happening to Earth's temperature and polar ice?

   Why is melting polar ice a problem?

   How might the weather in Aotearoa, New Zealand change?

2. Read and discuss the learning intention or WALT and success criteria for this lesson (page 1).

3. As a class watch this video **What is a carbon footprint?** (2:00 minutes, The Simpleshow)

4. Discuss the video with students, ask them to mention one thing or product that they use in their daily lives and to think about all the energy that is used to make that product and transport it to them. The energy used will most likely have emitted CO_2 into the atmosphere – prompt students to think about:
   - The process of extracting/producing all the materials for the product
   - The manufacturing process of the product

- The transport to take it from the factory to them
- How people who work for companies commute or get to and from work

This discussion will help students as they start to identify their individual impact on climate change.

Independent online learning 5 minutes

Carbon emissions from different activities

5 Students start the lesson and read about carbon emissions from different activities, and they learn that the way we travel can have a big impact on these emissions (pages 1-4).

Class discussion 15 minutes

Calculating carbon dioxide emissions from a car journey to school

6 Ask students what they learned from their reading. Reinforce students' reading by acknowledging that sometimes students and adults, depending on where they live and what their circumstances are, have no choice about how they travel because the car is their only option.
Note: Warn against 'carbon-shaming' students (in the above situation), for factors that are out of their control.

7 Work with students to calculate the carbon footprint from Maia's car journey to school (page 5). Work through the maths with students on the whiteboard or with an online calculator.
Note: The calculations assume that Maia's drop off and pick up from school journeys are solely for that purpose and so they include the return leg of each journey.

Maia says, "*What is my carbon footprint from my journey to school? Working with your class, see if you can calculate how much CO_2 is emitted from my drive to school. Then double it because my daily drive home in the afternoon is the same distance. Here's what you'll need to know:*
- *I live 2.5km (kilometres) from school*
- *My morning drive to school is 5km (including driving the car back home)*
- *The emissions from our medium-sized petrol car are estimated at 192g carbon dioxide (CO2) per km*
- *On average there are 192 school days in a year*"

Answer: Emissions from Maia's journey to school – 5km x 192g = 960g CO_2

Answer: Doubled to include her daily pick up from school – 960g x 2 = 1,920g CO_2

Maia says, "*A carbon footprint is usually talked about as a yearly or annual amount of CO_2 emissions. So, can you work out my carbon footprint from my return drive to school for the year? (Hint: It's a lot!)*"

Answer: 192 school days x 1,920g CO_2 per day = 368.64kg or nearly 369kg CO_2 annually.

Maia says "*How do you reckon I reduce my carbon footprint from my drive to school? I carpool with two friends Jing and Pene who live nearby. We're like carbon-fighting superheroes, reducing our individual footprints. So now my carbon footprint is two thirds (2/3) less, it's approximately 123kg CO_2.*"

8 Discuss with students the impact that carpooling can have and then lead a brainstorm by asking the class:

How could students (in general) reduce their carbon footprints from their school journeys?

Note: This could generate some fabulous ideas e.g. make all the roads skate paths – no cars allowed! It's a great opportunity to have some light-hearted discussions around a relatively heavy topic.

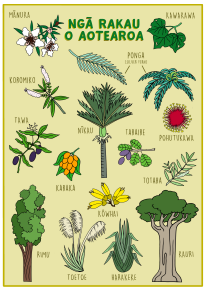
Out of all the ideas, ask students what they are already doing and what they could try to do over the next week? Ask students to write down their name and one thing they will try to do to reduce their carbon footprint from their school journey or any journey. Collect all the statements and put them somewhere visible to come back to.

Independent online learning 15 minutes

How many trees are needed to offset Maia and her friends' school carpooling journeys?

9 Students read about how carbon can be absorbed by trees (page 6). They are then asked to calculate how many trees would be needed to absorb the carbon dioxide (CO_2) from Maia and her friends' carpooling journeys to and from school.

Answer: 369kg /24kg CO_2 (absorbed by the average tree) = 15.3 trees



10 Students read about why planting more trees cannot be the only solution to climate change. They then learn about the many benefits of our native trees (pages 7-9).
(Poster image reproduced with thanks to Teacher Talk.)

11 Students read about the significance of the land to Māori and why it is important that all of us protect our environment (pages 10-11).

Note: To learn more about the importance of the land and kaitiakitanga, (guardianship and environmental conservation) talk with your local iwi.

12 Students choose the missing words to complete the following paragraph (page 12).
Answers in bold:

Kaitiakitanga is about protecting our land and environment for now and for future **generations**. One reason our trees and forests are important because they can absorb and store **carbon dioxide**. One way of protecting our environment is to reduce our carbon footprint. A big part of our **carbon footprint** is how we travel. We can think about the **travel** choices we have and when we can, choose **active** travel and walk, cycle, scooter or talk public transport like buses, trains and ferries. There are many other ways that we can reduce our carbon footprints too.

Class quiz and self-assessment 10 minutes

13 Run the 6-question **Kahoot!** quiz.

Quiz answers

1. Which of these statements best describes what your carbon footprint is?
a) The amount of carbon dioxide released into the world every day
b) The size of your shoe
c) The grams of carbon dioxide that come out of a car's exhaust
d) The amount of CO_2 released by your actions and by actions done for you

2. How much CO_2 can an average tree absorb from the air each year?
a) 24 kg per year
b) 750 kg per year
c) 2,400 kg per year
d) 24 g per year

3. Why can't we just plant more trees to absorb the excess CO_2?
a) We need the trees for firewood and building supplies instead
b) We don't have enough seeds to plant the number of trees we would need
c) There isn't enough land available to plant all the trees we would need
d) Growing trees produces more CO_2 than cars

4. Pick the wrong answer: When students are driven to school, this journey often...
a) Emits carbon dioxide - CO_2
b) Helps them to stay fit and healthy
c) Adds to traffic congestion
d) Releases more greenhouse gases into the atmosphere

5. Pick all the correct answers: How might you be able to reduce your carbon footprint?
a) Carpooling to school with a friend/s
b) Cycling or scootering to school
c) Walking to school or taking the bus
d) Any of these

6. What does kaitiakitanga involve?
a) Guardianship and environmental conservation
b) Restoration of the environment
c) Sustainability of the environment
d) All the above

14 Students use the tick boxes to indicate if they think they have achieved the success criteria or not (page 14).

15 Ask students what they learned today and discuss any questions they may have. Mention the next lesson (Lesson 4): *In our next lesson we'll be learning about what we need to know to stay safe when we travel.*

Extra activities

If students finish early, they have the option to complete one of the following activities (page 14):

E1. Students write and create a poster encouraging others to use active modes of travel, when they have an option. This solution-focused activity can be linked to the Enviroschools programme, Auckland Transport's Travelwise programme or any sustainability initiatives that your school is involved in. Also consider the potential to publish the students' work/posters on school websites, newsletters etc.

E2. Students can visit Google Earth and explore, they can:
Walk the Kepler Track or **Find hidden kākāpō** or **Explore penguin colonies**

E3. **Play Help the Joules**
Students help the Joules family in America decide which changes to make to reduce their carbon footprint. Students learn that sometimes just a few changes can make a big difference – the impacts of their choices will be reflected on the dashboard gauges.

E4. Guide the class as follows or set this as an independent activity:
Let's have a class kōrero (discussion) about our own carbon footprints. Think about what makes yours bigger or smaller. Then, let's brainstorm some easy ways we can all do better.
For inspiration, check out what **Kids Greening Taupō** are doing. Remember, every little bit helps.
Kia kaha in saving our planet!

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