

WithOnePlanet

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Investigate

Lesson 5

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Counting the cost of carbon

Years

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INQuIRY



Counting the cost of carbon

Lesson 5: Teacher notes

This document provides the teacher with the details of the lesson.

At a glance

To provide students with hands-on, shared experiences of:

- > a range of data sets showing changes in carbon dioxide emissions over different time periods
- > the connection between the release of energy from carbon compounds and climate change.

To support students to represent and explain their understanding of the production of carbon dioxide from human activity, the resulting change in atmospheric carbon dioxide concentrations, and the connection to climate change.

Sessions:

Analysing carbon dioxide concentrations.

Students:

Analyse a range of carbon dioxide concentration data for trends and patterns over time.

Calculating carbon emissions

Students:

Investigate carbon dioxide emissions at global, national and personal levels.

INQuIRY focus: Investigate

The *Investigate* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Investigate* phase ensures all students have a shared experience that can be discussed and explained.

In the *Investigate* phase students develop a literacy product to represent their developing understanding. They discuss and identify patterns and relationships within their observations. Students consider the current views of scientists and deepen their own understanding.

Assessment guide

This assessment guide supports teachers in identifying the types of assessment that are appropriate for this lesson.

Formative assessment is an important aspect of the *Investigate* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. It involves monitoring students' developing understanding of:

- > the production of carbon dioxide from human activity, the resulting change in atmospheric carbon dioxide concentrations, and the connection to climate change.

You will also monitor their developing science inquiry skills.

Summative assessment of the science inquiry skills is another important focus of the *Investigate* phase. Rubrics can be used to gauge the level of student achievement on performance tasks.

Key lesson objectives

Science

Students will be able to:

- > analyse graphs and tables, and construct graphs of current global carbon dioxide concentration data
- > generate and analyse individual, national and global carbon emissions data
- > develop an understanding of the links between carbon dioxide concentrations, carbon emissions and climate change.

Literacy

Students will be able to:

- > contribute to discussions about carbon dioxide concentration, carbon emissions and their respective links to climate change
- > record ideas, descriptions and explanations in diagrams, graphs and words in a variety of written modes.

This lesson also provides opportunities to monitor the development of students' general capabilities.

Teacher background information

Many different activities that use energy result in carbon dioxide being released into the atmosphere. Electricity generation from fossil fuels is a major contributor to increased atmospheric carbon dioxide concentrations.

As a result, data from a wide variety of sources, collected over a range of different time periods, shows global carbon dioxide concentrations trending upward.

Carbon dioxide concentrations can be determined on a range of time scales using different techniques. Human records are one such method, as are the analysis of ancient ice cores. Although they are representative of very different time scales, both sets of data show increasing global carbon dioxide concentrations, particularly in the recent past.

Carbon dioxide emissions from a variety of human and non-human induced activities and events are the cause of ever-increasing atmospheric CO₂ concentrations. Students can determine their role in the release of carbon emissions through online greenhouse gas calculators, such as the EPA Greenhouse Calculator. By answering a series of relatively straightforward questions about the lives and lifestyles of themselves and their families, students can gain a snapshot of their carbon dioxide contributions, also known as their ecological footprint. Comparisons can be made between their own footprint and the amount of arable land that is required to sustain that footprint. The information can also be extrapolated to show the number of planet Earths that would be required if everyone on the planet lived with the same carbon-intensive lifestyle. Students can compare their own ecofootprint with their fellow students, other schools, communities and against averages for their state and country. They can also develop an awareness of the ecofootprints of their Asia-Pacific neighbours and compare the livelihoods and lifestyles of such peoples with their own.

Students can use these comparisons as a springboard for action on a personal, school, community and national level. With support and guidance, students can act to minimise their impact on the planet and make connections with others locally and in the Asia-Pacific region to make a positive difference to the lives and livelihoods of both people and the environment.

Activity 1: Analysing carbon dioxide concentrations

Equipment

For the Class

- > Nil.

For each Student

- > A copy of the *Analysing carbon dioxide concentrations Student worksheet*
- > A pencil, pen and a ruler

Preparation

- > *Analysing carbon dioxide concentrations Student worksheet:*
 - Read through the *Student worksheet*

Lesson steps

1. Students to complete all of the tasks outlined in the *Analysing carbon dioxide concentrations Student worksheet*.

Activity 2: Calculating carbon dioxide emissions

Equipment

For the Class

- > Access to the internet – specifically the *EPA Ecological Footprint Calculator* (EPA Victoria 2013) website: <http://www.epa.vic.gov.au/ecologicalfootprint/globalfootprint/index.asp>

For each Student

- > Each student will require a copy of the *Calculate your own carbon Student worksheet* and access to the internet.

Preparation

- > Check that the *EPA Ecological Footprint Calculator* website is available.

Lesson steps

1. Students are to complete the *Calculating your own carbon Student worksheet*. This will require support and guidance, in both calculating the students' ecofootprints using the online *EPA Ecological Footprint Calculator*, and in the analysis of their footprints and answering of the questions.
2. The final questions – Q4 and Q5 specifically – are both good opportunities for whole-class discussion, rather than students just completing individual answers.

Source:

EPA Victoria 2013, *Australia's Footprint*, viewed 30 December 2013, <http://www.epa.vic.gov.au/ecologicalfootprint/ausFootprint/>