Introduce

Lesson 1
Teacher notes
Caring for our carbon

Years 5 to 6

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INQuIRY

WithOnePlanet
Open education
An xpand Foundation initiative

Caring for our carbon

Lesson 1: Teacher notes

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

At a glance

To capture students' interest and find out what they know about carbon as a chemical and a component of other chemicals, how humans make use of the natural carbon-based processes to produce electricity and the consequences of this for the Earth, including living things.

To elicit students' questions about carbon, electricity production from carbon and the consequences for life on Earth.

Students:

> Use a *KHWL* thinking tool to record what they think they know, what they would like to know and how they can find out about carbon as a chemical, electricity production from carbon and the consequences for life on Earth.
> Use a mind map activity to sort and then suggest links between different concepts involving carbon.
> Discuss the understandings from these two activities with others, including the reasons they have for these understandings.

INQuIRY focus: **Introduce**

The focus of the *Introduce* phase is to spark students' interest and engagement, stimulate their curiosity, and elicit their existing beliefs about the topic. Students' existing ideas and questions can then be taken into account in future lessons.

Assessment guide

Diagnostic assessment is an important aspect of the *Introduce* phase.

In this lesson you will elicit what students already know and understand about carbon and carbon-based chemicals and sort, discuss, represent and share their ideas about carbon as a chemical, as the basis for electricity generation, and the consequences of this for life on Earth.

Key lesson objectives

Science

Students will be able to represent their current understanding as they:

> Summarise their understanding of carbon as a chemical and a component of other chemicals, electricity generation from carbon and the consequences for life on Earth.
> Generate questions regarding their understandings.
> Suggest ways in which they can seek answers to their questions.

Literacy

Students will be able to:

> Contribute to discussions about carbon, its role in electricity generation and the consequences for life on Earth.

> Record, sort and summarise their descriptions, explanations and ideas using words, drawings and/or mind maps.

Teacher background information

Carbon is a chemical that can exist on its own or combined with other chemicals. Common combinations include carbon dioxide, sugar, petrol and other more complicated structures in all living and non-living things.

When carbon exists in 'fossil fuel' forms, such as coal, oil and natural gas, these chemicals can be mined from beneath the Earth's surface and then burnt to generate energy. This energy can be converted into electricity that can be used in our homes and in industry to sustain our lives and livelihoods as we currently know them.

One of the major by-products of this type of electricity generation is the production of carbon dioxide. When burnt in power plants, the carbon from fossil fuels is released into the atmosphere and combines with oxygen to produce CO_2. The power plants allow the carbon dioxide to float off into the Earth's atmosphere where it behaves as a greenhouse gas. Greenhouse gases, including carbon dioxide, cover the Earth like a large insulating blanket and prevent heat from leaving the Earth's atmosphere and being released into space. This process (also known as the greenhouse effect) is of immense benefit to the survival of living things on the Earth. When there is excess CO_2 in the atmosphere, however, too much heat can be retained by the Earth (also known as global warming).

Global warming, more accurately known as climate change, has many varied effects on the climate systems of the Earth, which can impact on the survival of living things. In some places on Earth, the weather becomes wetter or more prone to large, destructive storms, hurricanes, tornadoes, floods and other destructive weather events, while in other places, the weather can become drier and more prone to drought, fire and desertification. Both of these consequences, as well as many others, place pressure on living things and make their survival more difficult. The ultimate consequence for some living things is that they can become extinct.

People of all ages and situations can take action to reduce the rate and impacts of climate change through changes they can make to their own daily activities. These can range from simple measures such as walking more often and using the car less, to eating less meat and planting more trees. The familiar mantra 'rethink, reduce, reuse, recycle' can be considered when making decisions about daily activities and how these can positively or negatively impact on the planet. All these actions ultimately reduce the amount of greenhouse gas that is produced (usually by reducing the amount of electricity required). A person's ecological footprint is an indication of how much energy (usually electricity) a person uses for their daily activities, and can be reduced through environmentally conscious practices.

The positive impact of a lower ecological footprint, when viewed collectively within a population, can be felt not only for the population itself, but for others in the local, regional and global communities. When populations or communities are less affluent, their ability to reduce their ecological footprints is either reduced, or unnecessary, given their current frugal lifestyles. One of the many impacts of an Australian individual reducing his or her ecological footprint is that our regional neighbours in less affluent countries are not unfairly disadvantaged by our carbon-intensive activities.

Equipment

For the Class

Access to three YouTube videos:

> Reverse the melt
> Save the coal
> It's all about carbon

For the Group

For *Carbon on my mind … map* activity:

> One piece of A2 white card
> One A3 envelope containing all image boxes and text boxes from the *Carbon on my mind … map Teacher resource document*. (Note: The image and text boxes can be cut out individually or the entire worksheet can be provided for students to cut out.)
> 2–3 glue sticks
> One pack of coloured textas
> *Optional*: 2–3 pairs of scissors – if students are cutting out image and text boxes themselves

For each Student

> *KWHL* chart *Student worksheet*
> Approximately 3–5 sticky notes (with more available if a student requires them)
> Coloured pencils
> *Carbon on my mind … map Student worksheet*

Preparation

> Check resources needed throughout the unit and plan their preparation.

Lesson steps

1. Explain to students that they will be viewing three short videos, each of which has something to do with carbon.
   a. Reverse the melt: http://youtu.be/ZfmYeo7SbR4
   b. Save the coal: http://youtu.be/KMsnPh-pvWU
   c. It's all about carbon: http://youtu.be/ypbb9Zi5Tao
2. During each video, students to take notes using the *Note taking Student worksheet*. After each video, students to summarise their notes and add any other thoughts, ideas and opinions to the *Note taking Student worksheet*.
3. After each video, ask students to share their reactions to the video. Ask students what possible links they think each video has with **carbon**. The teacher can create three lists of these links – one list for each video.
4. Students to complete the *KWHL chart Student worksheet* individually. Refer to student worksheet for instructions.
5. Facilitate a discussion of students' responses to the ***K, W*** and ***H*** sectors of their charts.
6. Provide groups of 3–5 students with the *Carbon on my mind … map Student worksheet*, and associated equipment – refer to equipment section above for details.

7. Students to complete the *Carbon on my mind … map* activity in their small groups. The teacher can refer to the instructions on the *Student worksheet*, or the students can work through the worksheet as a group activity.
8. Students to display their posters and observe the other posters that have been completed during the activity. The posters can remain on display during the unit as a point of reference for student learning.
9. Facilitate a discussion about students' thoughts on their own group's mind map and other groups' mind maps. Some prompt questions for this discussion could include:

   a. Were you able to recognise all of the images you were provided with?

   b. Which images do you think had obvious connections to carbon? Which images did you find difficult to link to carbon?

   c. Did other groups have similar or different links to your group?

Sources:

Reverse the melt – Connect4Climate iChange competition 2013, *Reverse the melt*, online video viewed 1 March 2014, <http://youtu.be/ZfmYeo7SbR4>.
Connect4Climate 2013, *Save The Coal - Connect4Climate iChange competition*, online video viewed 24 February 2014, <http://youtu.be/KMsnPh-pvWU>.
NPR 2009, *Episode 1: Global Warming, It's All About Carbon*, online video viewed 24 February 2014, <http://youtu.be/ypbb9Zi5Tao>.

Caring for our carbon

Lesson 1: Teacher resource

This document provides the teacher with the resources for this lesson.

Instructions

Below you will find all of the words and pictures that belong in each envelope for this task. Each picture/word is contained within a separate square.

Make enough copies of these pictures so that all envelopes contain all pictures. You may like to either cut out each image before placing it in the envelope, or leave the pages intact for the students to cut out.

Words and pictures

Mind map central title: Carbon

CARBON	

Main category boxes: add your own words/pictures to these boxes. (NOTE: You do not need to use all of these six boxes if you don't have this many categories.)

1

Main category word	Main category picture

2

Main category word	Main category picture

3

Main category word	Main category picture

4

Main category word	Main category picture

5

Main category word	Main category picture

6

Main category word	Main category picture

Pictures:

More pictures:

More pictures:

Add your own pictures:

Words:

Greenhouse gases	Climate change
Ecological footprint	Carbon compounds
Electricity	Carbon dioxide
Carbon cycle	Charcoal
Biodiversity	Atmosphere

More words:

Photosynthesis

Fossil fuel

Impacts

Methane

Energy

Electricity

Sustainability

Pollution

Main category word

Main category word

Spare word boxes

Spare picture boxes