

WithOnePlanet

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Investigate carbon

Lesson 4

Teacher notes

Searching for carbon

Years

3 to 4



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INQuIRY



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Searching for carbon

Lesson 4: Teacher notes

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

At a glance

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

- > how living things take up and use carbon from the environment and release it back into the environment
- > how natural and man-made process affect carbon in the earth
- > the ways that humans can manipulate carbon to produce energy, including heat.

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:

- > how living things take up, use and release carbon
- > how natural and man-made processes can affect carbon in the earth
- > the ways that humans can manipulate carbon to produce energy.

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 observe:

- > living and non-living things that contain carbon and explain how carbon is taken up, used and released from these things
- > carbon in the earth and explain how natural and man-made processes can bury and remove it from the earth
- > how carbon can release energy as heat and the effects of this on carbon-based substances.

Literacy

Students will be able to:

- > contribute to discussions about different things that contain carbon, how carbon can be released from different things and how carbon can be burned to release energy
- > record their observations, ideas and descriptions in drawings and words.

Teacher background information

Carbon is an element that forms many of the living and non-living structures on Earth. There are many other elements that make up these structures, including hydrogen and oxygen. Together, in an endless variety of combinations, carbon and all of the other elements on Earth make up every single living and non-living thing on the planet.

The entire body of any living thing, such as a human or the tallest tree, is mostly made of carbon, combining with many other different elements. For this reason, scientists sometimes call living things 'carbon-based life forms'. Living things take up carbon by eating other living things, such as plants and other animals. They also breathe out carbon dioxide, adding more carbon dioxide to the air. In this way, living things can take the energy from the carbon substances they consume and remove the waste carbon.

Non-living things such as rocks, and dead things such as decaying plants and fossils, are also mostly made up of carbon. As living things decay, the carbon they are made of enters the soil and the air. Dead plants and animals can accumulate over extremely long periods, and under the right conditions, such as low oxygen levels and high sediment build up, the pressure of these sediments weighing down on the dead material can eventually cause it to form coal, oil, natural gas and in very rare circumstances, diamond.

Humans can actively release carbon from various stores on the Earth. One way is to burn plants (i.e. wood). The carbon releases its energy into the environment as heat and light, and the carbon is released into the air as carbon dioxide. Coal, oil and natural gas can also be burnt – usually in power stations – to release heat. The heat is then used to produce electricity.

Equipment

- > Students will each require a copy of the *Searching for carbon - Student fieldwork activity*.

Preparation

- > For the *Searching for carbon - Student fieldwork activity*:
 - Find a natural setting in which to conduct the lesson.
 - Familiarise yourself with different objects that can be seen in the location that contain carbon.

Lesson steps

1. This lesson is best conducted outside in a natural setting.
2. Explain to students that another reason carbon is so hard to capture is that it is everywhere but you can't see it. It hides in living things, like trees and people. It also hides in dead things, like leaves that have fallen from trees. It can even hide in non-living things such as rocks and deep below the Earth's surface.
3. Ask students if they can see any carbon when they take a look around them.
4. Provide students with the *Searching for carbon - Student fieldwork activity* and ask students to complete task 1.

5. Ask students to contribute some of the things they wrote down in their lists. Use one or more of these things to provide an example of how to complete the other two columns. Use prompt questions, such as the following, to do this: (The example used below is 'trees'.)

 - Do you think trees contain carbon? Why/why not?
 - Can you see the carbon in the trees? Why/why not?
 - How can you tell if there is carbon in trees if you cannot actually see the carbon?
 - How can you find out if carbon is in there?

6. Ask students to complete the rest of the table, even if they are not sure whether any of the things on their list contain carbon or not.
7. Facilitate a discussion about the third column of the table. What suggestions did students have for determining whether an object contained carbon or not?
8. Find a location that contains plants of different sizes.
9. Help students to draw/label the diagram of the tree on page 2 of the *Searching for carbon - Student fieldwork activity* with all the things that they think it needs from the environment so that it can grow bigger. (One of these things – minerals from the soil – is already provided on the diagram as an example.)
10. Use the students' completed diagrams to facilitate a discussion, using the following prompt questions:
 - What do plants need to live and grow? (*sunlight, water, soil ...*)
 - Do plants like these ones contain carbon?
 - Do plants need air to grow?
 - What is in the air that plants need so that they can grow? (*carbon in carbon dioxide*)
 - Where do plants get all the new substances from that allow them to get bigger? (*from the air!*)
 - So plants grow from the air, not from the soil!
11. Ask students to modify their tree diagrams if necessary to include carbon from the air.
12. Now ask students to add, in a different colour, all of the things that they think the plant *releases into the environment*. (This is a more difficult question and students may not be able to add anything to their diagrams at this stage.)
13. Use the students' updated diagrams to facilitate a discussion, using the following prompt questions:
 - Do plants release anything into the environment?
 - What do plants release that allows animals like us to live on Earth? (*oxygen*)
 - If we wanted to release the carbon from trees, what could we do? (*burn them – i.e. firewood*)
14. Ask students to modify their tree diagrams if necessary to include carbon being released into the air.
15. Repeat steps 9-14 above, this time with the diagram of the person on page 3 of the *Searching for carbon - Student fieldwork activity*.
 - *Humans need food (a source of carbon); oxygen (from the air).*
 - *Humans release carbon dioxide (breathing out); waste (solid waste – faeces – also contains carbon).*
16. Ask students to return to their lists on page 1 of the *Searching for carbon - Student fieldwork activity* and identify any non-living things on their list. Ask students whether they decided that these non-living things contained carbon or not.

17. Use the students' lists to facilitate a discussion, using the following prompt questions:

- Do non-living things, such as rocks, soil and air, contain carbon?
- What about deep down in the earth ... is there carbon down there?
Carbon deep underground often takes the form of coal, oil or natural gas.
- What are these types of carbon often used for? (*for producing energy*)
- If we wanted to use carbon from deep underground, how could we get it? (*mining, digging it up ...*)
- Once we have this source of carbon, how can we release the energy from it? (*by burning it*)
- What else is released when we burn things like trees or coal? (*carbon dioxide is released*)

24. Ask students to think of drawings or labels for the sources of carbon that can be burnt to produce energy and carbon dioxide. Then ask them to add their drawings and labels into the diagram of the flame on page 5 of the *Searching for carbon - Student fieldwork activity*.

25. Use the students' completed diagrams to facilitate a discussion. What suggestions did students have for the sources of carbon that can be burnt to produce energy and carbon dioxide?