Science Year 6 Unit 4

**Lessons 11-16 Assessment Task:**

Amazing Agrichar (Biochar) and its effect on plant growth and yield.

**Time:** Introductory Lesson 55 minutes; regular watering & measuring over 6 weeks

### Content descriptions

<table>
<thead>
<tr>
<th>Science Understanding</th>
<th>Science as a Human Endeavour</th>
<th>Use and influence of science</th>
<th>Science Inquiry Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological sciences</td>
<td>Nature and development of science</td>
<td>Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples’ lives.</td>
<td>Planning and conducting</td>
</tr>
<tr>
<td>The growth and survival of living things are affected by the physical conditions of their environment.</td>
<td>Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena.</td>
<td>Scientific knowledge is used to inform personal and community decisions.</td>
<td>With guidance, select appropriate investigation methods to answer questions or solve problems.</td>
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**Processing and analysing data and information**

- Compare data with predictions and use as evidence in developing explanations.

**Evaluating**

- Suggest improvements to the methods used to investigate a question or solve a problem.

**Communicating**

- Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts.

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### General capabilities

**Literacy**

Students will use and develop an understanding of science language specific to this lesson. This will include:

- technical vocabulary and everyday language used in science contexts (e.g. seeds, germinate, terra preta, biochar, agrichar, soil type)
- procedural vocabulary (e.g. predict, record, analyse, evaluate).

**Critical and creative thinking**

Students will analyse and evaluate evidence and summarise information.

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### Safety

- A CARA for this task will be provided to participating schools by Paluma EEC.
- In the interim, teachers need to refer to the Workplace health and safety (WHS) policy pertaining to schools.

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*The Australian Curriculum: Science for Prep (F)–10 Version 1.2 [accessed on 16 October 2011]*

http://www.australiancurriculum.edu.au/Science/Curriculum/F-10
<table>
<thead>
<tr>
<th>Lesson objectives</th>
<th>Students will:</th>
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<tbody>
<tr>
<td></td>
<td>• understand the effect on plant (sorghum) growth and yield of variation in soil type and application rates of biochar</td>
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<td>• understand the positive and negative effects of biochar.</td>
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<thead>
<tr>
<th>Evidence of learning</th>
<th>Can the student:</th>
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<tr>
<td></td>
<td>• identify environmental factors that affect the growth and yield of sorghum?</td>
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<td></td>
<td>• identify functions of carbon as biochar in the environment?</td>
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**Prepare**

**Assessment task:** Amazing Agrichar (Biochar) and its effect on plant growth and yield.

**Helpful information for teachers (distributed at professional development workshop)**

- Biochar for sustainable soil, agriculture and energy systems (Hodgson, Bevan & Farrah)
- Biochar Fact Sheet (CSIRO)
- Terra Preta: Soil Improvement and Carbon Sequestration (Johannes Lehmann)
- The ‘Terra Preta’ phenomenon: a model for sustainable agriculture in the humid tropics (Bruno Glaser, Ludwig Haumaier, Georg Guggenberger & Wolfgang Zech)
- Black is the new green (Emma Marris)
- Sustainable biochar to mitigate global climate change (Dominic Woolf, James E. Amonette, F. Alayne Street-Perrott, Johannes Lehmann & Stephen Joseph)

<table>
<thead>
<tr>
<th>Learning area specific language (metalanguage)</th>
<th>seeds, germinate, terra preta, biochar, agrichar, soil type</th>
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The [Australian Curriculum: Science](https://www.australiancurriculum.edu.au) includes a glossary of definitions of language specific to the science learning area. (Select Download.) Definitions of science terms are also available from the [C2C: Science glossary](https://www.c2c.edu.au/glossary/).

<table>
<thead>
<tr>
<th>Misunderstandings and alternative conceptions</th>
<th>Students may demonstrate the following misunderstandings or alternative conceptions:</th>
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<tr>
<td></td>
<td>Students may think that all carbon is bad for the environment. Inform students that while carbon is a natural part of the nutrient cycles, too much carbon being released into the atmosphere has been linked to climate change.</td>
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<tr>
<td></td>
<td>Students may think that soil is safe to handle. Inform students that soil is safe to handle as long as good hygiene is practised.</td>
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<tr>
<td></td>
<td>Students may think that all soil is the same. Inform students that there are many different types of soil.</td>
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### Relevant aspect of the Achievement Standard

In this unit, the assessment of student learning aligns the following components of the Achievement Standard.

By the end of Year 6 students plan investigations to answer questions relating to simple cause-and-effect relationships. When carrying out investigations, they collect relevant data and apply the concept of a fair test. They reflect on the processes that they have used and demonstrate an awareness of science inquiry methods in their work. They represent data and knowledge using introductory scientific language and graphical representations.

Students suggest explanations for observable changes and they predict the effect of environmental changes on living things. They compare different types of change in materials. They identify requirements for the transfer of electricity and describe one way that electricity can be generated. They describe how developments in science have affected peoples’ lives and identify examples where scientific knowledge is used in decision making.

<table>
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<th>Assessment purpose</th>
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<td>To plan, conduct and evaluate an investigation that identifies the best amount of biochar to add to three different soil types (clayey, sandy and composted soils) and apply this knowledge to practical situations.</td>
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# Teaching and Learning Sequence

## Opening the lesson

### Teaching strategy used
Interactive teaching: Whole-class discussion

Explain to students that so far in the unit they have seen environmental conditions that have a positive and negative impact on the growth and survival of living things.

Discuss the effect of the environment on living things

**Focus questions:**

- WHAT EVIDENCE HAVE WE SEEN OF ELEMENTS OF ENVIRONMENTS THAT POSITIVELY AFFECT THE GROWTH AND SURVIVAL OF LIVING THING?
- WHAT EVIDENCE HAVE WE SEEN OF ELEMENTS OF ENVIRONMENTS THAT NEGATIVELY AFFECT THE GROWTH AND SURVIVAL OF LIVING THING?
- WHEN WOULD YOU WANT AN ENVIRONMENT TO POSITIVELY AFFECT A LIVING THING?
- WHEN WOULD YOU WANT AN ENVIRONMENT TO NEGATIVELY AFFECT A LIVING THING?

## Body of lesson

### Teaching strategies used
Indirect teaching: Inductive teaching

View the video on the ABC Science website: [Agrichar – A Solution to Global Warming?](#)

Display pages 1 & 2 of the CSIRO Biochar Fact Sheet. Discuss the process for making biochar (slow burning of organic material in the absence of oxygen – “pyrolysis”). When organic materials undergo pyrolysis, biochar and biofuels are produced, both of which have a number of applications.

Discuss the diagram on page 2 of the CSIRO Biochar Fact Sheet, enabling students to make connections to potential local applications.

Remind students that their assessment task deals only with the addition of biochar to agricultural soils.

**Review with students the purpose of the assessment task:**

To plan, conduct and evaluate an investigation that identifies the best amount of biochar to add to three different soil types (clay, sandy and composted soils) and apply this knowledge to practical situations.

Work through the Guide To Making Judgments with students to highlight the assessable elements for the assessment and discuss with them what responses might look like at each of the standards A–E.

Provide students with an opportunity to clarify any components of the assessment.

## Introduce the assessment task

**Distribute the assessment task Amazing Agrichar** and direct students to complete the reading comprehension section individually. Discuss answers with the class when completed.

Read Part A of the assessment task with the class. Explain to students that they will set up the investigation as part of a small group. Each small group will set up 9 pots with 5 sorghum seeds in each. The teacher needs to set up a set of 9 pots as well, to be kept alive until the Science Week presentation in August.

Students complete Part A. Once Part A is completed, the investigation will need to be set up.

Read Part B with the class. Recording of results should be undertaken on the same day of each week, for six weeks. At the end of six weeks, students work individually to complete Part B.

Read Part C with the class. Students work individually to complete Part C.
### Closing the lesson

**Teaching strategy used**

**Direct teaching**

- Discuss the results found in the investigation.
- Inform students that these results will be presented to their local community during Science Week in August.
- Discuss the potential applications of this knowledge in local industries e.g., the sugar cane industry, horticulture or improved pastures for grazing.
- Display the posters designed by each student.
- Discuss how students will present their investigation to the community e.g., display of posters, exhibiting the remaining set of plants, talking to the community.

In 2013, students will have the opportunity to present their findings and their posters to district Science Week events in August.