Carbon capture

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This resource was developed as a result of participation in CSIRO's teacher professional learning program, Teacher Researcher in Partnership Program.

FERNY GROVE
State High School

Science Department
Year 8

This Ferny Grove State High School Unit is based on Earth & Space

Title: Catch that Carbon	**Duration: 2 weeks**

Teaching and Learning Sequence and Related Resources

Week 1 – 3 Lessons	
L1 : **Title: Pre-knowledge test & Misconceptions** **Learning Intentions** **KNOWLEDGE** – students will learn about: Inquiry: Climate change and greenhouse gasses **SKILL** – students will learn to: Understand the basics of the enhanced greenhouse effect and key gases involved **L2:** **Title: Carbon capture - what is it?** **Learning Intentions** **KNOWLEDGE** – students will learn about: CSIRO current Carbon & Methane capture technology **SKILL** – students will learn to: Analyse a **short text** based on current CSIRO carbon capture technology Build vocabulary Work in pairs to discuss advantages & disadvantages Analyse using a PMI chart Numeracy calculating	**Additional Resources:** Pre-test what do students know about climate change? https://www.abc.net.au/science/games/quizzes/2009/climatechange/ Teacher to **show pictures and powerpoint** about lab experience **Websites: Video explaining carbon capture & storage** **https://www.youtube.com/watch?v=ROEFaHKVmSs** **https://breakingnewsenglish.com/1806/180611-carbon-capture.html** **Supporting learning resources:** **ENVIRONMENT:** Spend one minute writing down all of the different words you associate with the word "environment". Share your words with your partner(s) and talk about them. Together, put the words into different categories. **GLOBAL WARMING:** Rank these with your partner. Put the best ways to prevent global warming at the top. Change partners and share your rankings x 3.

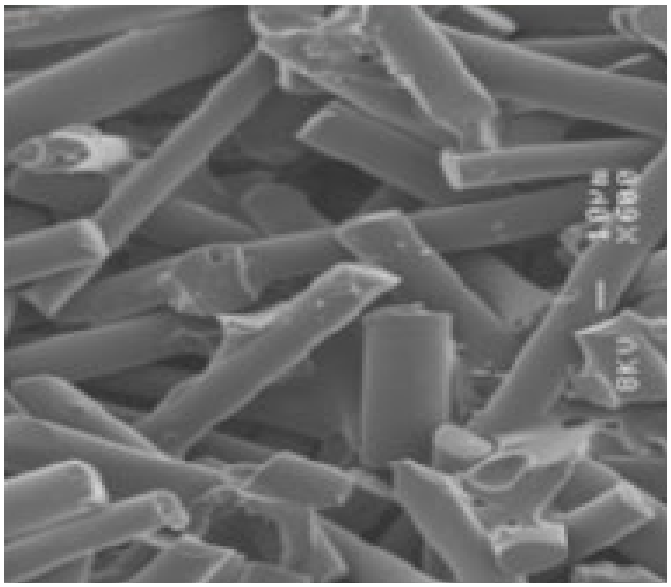
L3: **Title: Carbon capture what else is out there?** **Learning Intentions** **KNOWLEDGE** – students will learn about: carbon capture technology (biocells, storage, other technologies from other Research groups) **SKILL** – students will learn to: Research Note taking Evaluate resources	Use less hot water**,** Plant a tree**,** Eat less meat**,** Turn off lights**,** Drive less, Go solar, Recycle, Reduce waste Use synonyms, gap fill and comprehension questions for text work **&** Write 5 good questions about carbon capture, exchange with a partner **Evaluation matrix** for internet research
Weeks 2 3 Lessons	
L1&L2 Title: Carbon capture symposium **Learning Intentions** **KNOWLEDGE** – students will learn about: Different ways of carbon capture **SKILL** – students will learn to: Present their findings to peers Using ICT to arrange researched information in a digital presentation tool (glogster) Assess peer presentations using a rubric L3: Formative extended writing response: Carbon capture will reverse climate change. Discuss (why, how, what) 1 Lesson in class 250-300 words	**Additional Resources:** **Glogster teacher access or alternative online collaboration tool** **Peer rubric** **Supporting learning resources:** **Task sheet** formative assessment

Carbon capture

Growing concerns regarding climate change have attracted widespread efforts to develop efficient and cost-effective technologies for CO_2 capture from industrial sources such as coal-fired power plants to minimise CO_2 emissions and combat global warming.

CO_2 capture using porous solid sorbents (substances which have the property of collecting molecules of another substance by absorption or adsorption) appears to be a promising solution. Among them, porous carbon materials are particularly suited to CO_2 capture because of their microporosity (containing very narrow pores), ease of fabrication and excellent chemical, thermal and mechanical stability. Porous carbons have been produced since antiquity by charring coal and charcoal has been used for the purification of water and as a medicine.

However, achieving acceptable attachment rates of CO_2 from combustion exhaust gas streams of coal-fired power plants to the surface of the sorbent remains a challenge. Approaches to improving CO_2 uptake of porous carbons have focused on chemical activation. These methods have disadvantages such as greater complexity and cost.



Microscopic morphology

At CSIRO's Queensland Centre for Advanced Technologies the research is focused on developing a simple and cost-effective way to fabricate physically activated carbon composite monoliths that contain honeycomb structures with superior CO_2 sorption properties. Studies in the Lab determine the pore size of the sorbent, CO_2 adsorption rates under different conditions (heat and pressure) as well as the time needed to capture the CO_2 from a gas stream.

Fabricated (HMCFC) length: 80mm, diameter: 30mm, number of channels: 17

Carbon capture

Activities

a. Vocabulary: match the correct meaning

WORD	MEANING
widespread	The outside or upper layer of something
combustion	Catching or trapping something
capture	Action of manufacturing something
fabrication	The process of burning something
charring	A way of dealing with a situation
surface	Found or distribituted over a large area
approaches (noun)	The state of something
conditions	Partially burn so as to blacken the surface

b. Synonyms: find a synonym for each of the following words

WORD	SYNONYM
thermal	
combat	
substance	
challenge	
superior	
promising	
rates	

c. Comprehension: answer the following questions

Where is the research taking place?
Where is the CO_2 captured from?
What is the process of CO_2 hoping to combat?
Since when have porous carbons been made?
What are the disadvantages of chemical activation?
What type of monoliths is CSIRO developing?

Ferny Grove State High School
An Independent Public School

YEAR 8 Science

Formative

Student Name:				
Class:		**Teacher:**		
Unit 1 **Draft Date:**		**N/A**	**Due Date:**	**Week Term**

CONTEXT

Growing concerns about global warming and climate change have Scientists looking for new ways to combat these issues. One of the greenhouse gasses, Carbon dioxide, is at the center of attention due to the release of large quantities of this gas by burning fossil fuels. Reducing the emissions of CO_2 is one way to minimise the effects but new technologies are addressing CO_2 reduction in different ways.

Task	**Text Type:**	Extended Response

You have learnt about the technology of carbon capture. You are required to write an extended response to the statement " Carbon capture will reverse climate change".

Cognitive Verbs

- Assess
- Compare
- Conduct
- Consider
- Discuss
- Evaluate
- Apply
- Express
- Justify
- Identify
- Determine
- Develop
- Define
- Describe

Vocab

- Climate change
- Carbon dioxide
- Technology
- Absorption/adsorption
- storage
- emissions
- greenhouse gas
- photosynthesis
- fossil fuel
- human-induced

Conditions

Audience:	Classroom Teacher
Class working time:	1 X 70 MIN CLASS
Length:	Approximately 250-300 Words
Final Submission Requirements:	All questions answered, correct spelling and punctuation
Materials allowed:	Materials supplied in class + any supplied & negotiated with class teacher
Other:	N/A

Student Acknowledgement:
I acknowledge that this is my original work. If I have used research material, it has been correctly referenced. I give Ferny Grove SHS permission to use and reproduce my work for publication and promotion purposes. School policy regarding plagiarism and assessment is located in the student diary.

Student Signature:

Date:

Helpful Hints

Key Terms:

Compare: display recognition of similarities and differences and recognise the significance of these similarities and differences
Define: give the meaning of a word, phrase, concept or physical quantity; state meaning and identify or describe qualities.
Describe: give an account (written or spoken) of a situation, event, pattern or process, or of the characteristics or features of something.
Evaluate: make an appraisal by weighing up or assessing strengths, implications and limitations; make judgments about ideas, works, solutions or methods in relation to selected criteria; examine and determine the merit, value or significance of something, based on criteria.

Sentence Starters:

There are several/ many reasons for…
The weight of evidence would suggest…
…this a better option than…
In the case of…, the following details have emerged…
The main difference between…
Clearly, it can be concluded that…
Upon examination it is seen that…

Connecting ideas within and between sentences:

The reason for…	This is why…
However…	Therefore…
On the other hand…	Contributed to…
Thus…	Although…
In order for…	Hence…
As a result…	Because…

Answer all questions in full sentences with correct spelling and punctuation.

Define climate change and provide three examples of its impact. (25 words)

Compare the difference between reducing carbon emissions and capturing carbon. (50 words)

Describe a method of carbon capture. Include the science of the technology, who invented it and whether it is currently in use or in testing stages. (100 words)

Evaluate the use of Carbon Capture technology on reducing the impact of climate change (100 words).

Student name: _____ Year level:_____ Class: ____ Teacher:_____

Nature and development of science	• examination and justified explanation of how different science knowledge is used in occupations • justified explanation of how evidence has led to an improved understanding of a scientific idea	• examination and explanation of how different science knowledge is used in occupations • informed explanation of how evidence has led to an improved understanding of a scientific idea	• examination of the different science knowledge used in occupations • explanation of how evidence has led to an improved understanding of a scientific idea	• description of science knowledge used in science occupations • description of how understanding of a scientific idea has changed	statements about: • science used in occupations • scientific ideas
Use and influence of science	• thorough description of situations in which scientists collaborated to generate solutions to contemporary problems • thorough reflection on the implications of these solutions for different groups in society	• informed description of situations in which scientists collaborated to generate solutions to contemporary problems • informed reflection on the implications of these solutions for different groups in society	• description of situations in which scientists collaborated to generate solutions to contemporary problems • reflection on the implications of these solutions for different groups in society	• identification of situations where scientists generate solutions to contemporary problems • identification of implications of these solutions	statements about: • solutions to contemporary problems • implications of solutions
Communicating	concise and coherent use of appropriate language and accurate representations to communicate science ideas, methods and findings in a range of text types	coherent use of appropriate language and accurate representations to communicate science ideas, methods and findings in a range of text types	use of appropriate language and representations to communicate science ideas, methods and findings in a range of text types	use of everyday language and representations to communicate science ideas, methods and findings	fragmented use of language and representations to communicate science ideas, methods and findings

Teacher feedback:_____

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