

Curious kids – how do tongues taste food?

January 16, 2019

Authors: **Paulomi (Polly) Burey** Senior Lecturer (Food Science), University of Southern Queensland
Ursula Kennedy Lecturer of Wine Science, University of Southern Queensland

AVID's Critical Reading Process

This lesson will follow AVID'S reading process and will utilize the following strategies:

1. Pre-reading – Building vocabulary
2. Interacting with the text
3. Extending beyond the text

AVID's WICOR Methodology

This lesson utilizes the **WICOR** methodology.



The **WICOR** icon will be used throughout the lesson to communicate when an activity is using WICOR methods.



Writing Inquiry Collaboration Organization Reading



Cornell Notes

Essential Question:

How do readers actively read and isolate essential information in a text?

Close Reading for Emerging Readers: Teachers may choose to apply the critical reading process as listed above or discuss the story through a Close Reading process.

First Read

- Teacher reads aloud and uses self-talk when identifying new terms and main ideas. The text is placed on document reader so that students can follow along.

Second Read

- Chorally read with students. Discuss the new terms and main ideas.

Third Read

- Students partner read and write or draw details and main ideas.

Reading Prompt:

In this article, 'Curious kids – how do tongues taste food?', the authors explain how we use our senses to taste food. As you read the text, think about your favourite foods and how they taste. Which foods do you like? Which foods don't you like? Think about why you like or dislike different foods.

Estimated Preparation Time: 30 minutes

Estimated Instructional Time: 155 minutes

Recommended Pacing: 2-3 days

Using the AVID Resources

Teacher Resources

This page offers strategies and approaches that will help you prepare for the lesson, set expectations, and prepare for the reading.



Pre-Reading

Developing Students' Understanding of the Subject

(approximately 15 minutes)

- Discuss with students what they already know about how they taste food.
- <https://www.youtube.com/watch?v=C4rdqXXzPGU> – Video clip – How the tongue tastes food – 3.51mins
- Collect food samples and ask students to guess what they are. Encourage them to label the taste as sweet, bitter, sour, salty, umami. How does our tongue know the difference?

Building Vocabulary Vocabulary Cards

(approximately 30 minutes)

(student handout attached)

Materials: Index cards (several per student)

In this activity, students create a vocabulary card for each of the target vocabulary terms on the word wall. Distribute index cards to students; model the activity before asking students to create their own vocabulary cards.

1. On the lined side, divide the card into two sections.
2. Print the vocabulary word and its part of speech in the first section. Draw an illustration or symbol of the word.
3. Write a definition of the word in the second section.
4. Use the word in a telling sentence that gives clues to the meaning also in the second section.
5. On the back (unlined) side of the card, draw an illustration or symbol of the word. Students can quiz each other on these words

Adapted from ElWardi, R., Butler, M., Madigan, B., & Malo, C. (2006). *The Write Path English language learners' teacher guide* (p. 54). San Diego, CA: AVID Press.

The Write Path 1 English Language Arts: Exploring Texts with Strategic Reading pp36-38.

Key vocabulary examples may include:

- | | |
|----------------|------------------|
| - leisure | - trustworthy |
| - personalized | - house-bound |
| - retiring | - calming |
| - generously | - responsibility |
| - affection | - character |
| - intelligence | |
| - good humour | |
| - companions | |
| - loyal | |

NB: The second illustration uses much more precise language naming parts of the tongue but these are considered too elaborate for students at this level. You may like to refer them and translate into simpler language e.g. microvilli – tiny hairs



Interating with the Text

Re-reading strategies

Marking the text: Non-Fiction

Allow students to view a screened copy of the text to model and support the following activities:

Numbering the Paragraphs

(approximately 10 minutes)

Note: Students familiar with the 'Marking the Text' strategy may be able to mark the text during their first read. If not, have students read the text once without marking the text.

1. Go over the 'Marking the Text' strategy with your students. Students should have copies of this handout on their desks or the ideas from this handout should be available to them in some other way.
2. Begin with **numbering the paragraphs**. If students are not familiar with numbering paragraphs, we will need to support this through a call and response method: the teacher calls out the paragraph number and students respond with the first two words of the paragraph.

First Read: Circling Key Terms and Underlining Essential Information

(approximately 30 minutes)

Note: Depending on your students' skill levels, you may want to work through a few paragraphs as a class. You might also reduce the amount of rereading students do by directing them to specific paragraphs that contain essential information. Consider having your students work in pairs as they learn how to circle key terms and underline essential ideas in a text.

The Write Path 1 English Language Arts: Exploring Texts with Strategic Reading pp 157-161

Graphic Organiser

(approximately 30 minutes)

(student handout attached)

Explain to students that the purpose of this graphic organiser is to write supporting details under each of the subheadings. They may use their markings from the above activity to assist them. You might like to model how to do this by using a think aloud to complete notes under the first sub-heading, 'Brain'.

Differentiation:

- Provide students with a partially completed organiser
- Have students work in pairs or small groups until they are ready to work independently
- Provide many practice opportunities

Students may also use computers or interactive whiteboards to create their own organiser.

If students are working at a foundational level, complete the activity with direct instruction i.e. students provide responses to each sub-heading and the class collectively consents to which details are added with support from the teacher. This is an excellent way to introduce the use of graphic organisers to younger students.

The Write Path 1 English Language Arts: Exploring Texts with Strategic Reading pp 172-179



Responding to Text

Writing Prompts

(approximately 40 minutes)

Advanced:

Students complete a survey on each student's favourite foods. They organise responses under sweet, sour, bitter, salty or umami. They analyse their results and present their findings to the class. This may be completed as a group activity. Students will have to work together to create a survey form and collate results.

Intermediate:

Create a table and in the first column list your favourite foods. In the second column record whether they are sweet, sour, bitter, salty or umami.

Foundational:

Write a paragraph about your favourite foods and why you like them.

SAMPLER

Elaboration/Description: How do tongues taste food?

Brain

Taste buds

How tongues taste food

Smell

Saliva

Curious Kids: how do tongues taste food?

Authors: **Paulomi (Polly) Burey** Senior Lecturer (Food Science), University of Southern Queensland

Ursula Kennedy Lecturer of Wine Science, University of Southern Queensland

The Conversation: January 16, 2019

Dear Ridley,

This is a really good question. Tasting food actually uses all of your senses. Your senses gather up all the information and combine it into a message about the taste of food that gets sent to your brain. For example, your eyes help you recognise food and remember how it tastes.

Your tongue has special parts that pick up flavour, bundled together as taste buds. They help you taste different flavours, like sweet, salty, sour, bitter, and a special one called “umami” which some people say is a bit like a mix of all the others put together. The taste buds pick up clues about how a food tastes and sends messages about it to your brain along special wires called nerves.



Flickr/Jessica Lucia, CC BY-SA

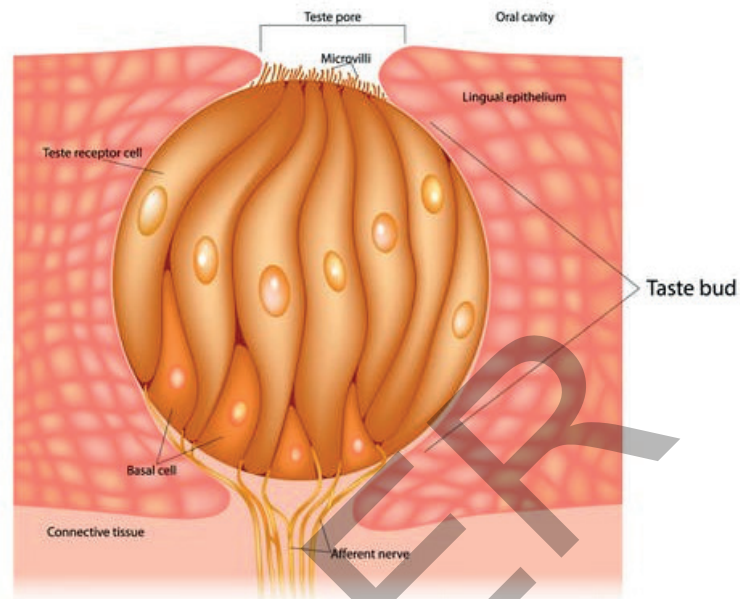
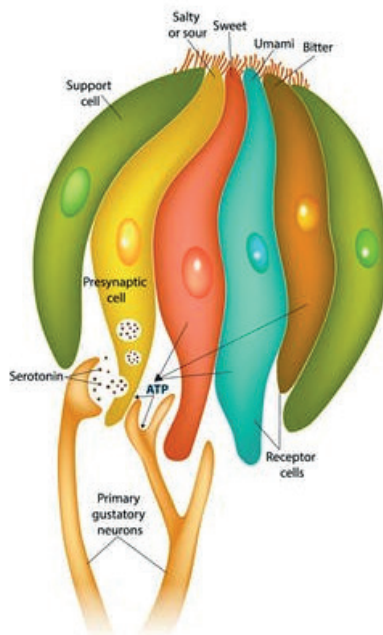


It's not just about the tongue. The five senses - taste, touch, sight, hearing and smell - help collect messages about a food and send it to your brain. Shutterstock

To taste something properly, you need to chew food into small pieces and to have a lot of drool, or saliva. This helps the flavour molecules (also known as “tastants”) reach your taste buds.

Try this experiment: if you lick a piece of sliced apple, how does it taste? Now drink some water to wash away the flavour, and take a bite of the apple and chew it up. When you cut an apple, only some flavour is released. But if you chew it into smaller pieces, more flavour can escape into your mouth.

Foods taste sweeter if the sugar particles are smaller. Want to try another experiment? With permission, put some large sugar crystals on your tongue for five seconds. How sweet do they taste? Now rinse your mouth with water and put some fine icing sugar on your tongue – is it sweeter or less sweet than the big sugar crystals? The smaller the sugar particles are, the easier it is for your tongue to taste the sweetness. (For the adults reading, this is because smaller particles have a higher surface area). This trick helps food scientists develop sweet foods with less sugar.



Your brain gets messages from your taste buds via nerves. Shutterstock

Saliva and smell

When you chew your food, you also produce saliva (or spit) which dissolves some of the food flavour for you to tongue taste.

Want to try another experiment? Stick out your tongue as far as it can go and dry the saliva off with some thick paper towel. While your tongue is still sticking out, have your parent put some food on your tongue, like yoghurt. How strong is the flavour? Next, pull your tongue back into your mouth and taste the food. Is the flavour stronger, weaker, or the same?

If your nose is blocked, food tastes weaker. This is because your nose also helps you “taste” food too. Try it! While holding your nose closed, put some food in your mouth and chew. Can you taste it? While still eating the food, let go of your nose and keep eating. Is the flavour stronger, weaker, or the same? In fact, without your sense of smell it can be hard to taste the difference between a raw apple and a raw onion!

So your tongue and nose work together to help you taste your food. I hope you can help your tongue taste more by chewing your food fully and using your saliva to help make the flavour stronger. And if you have something to eat that you don’t like, try holding your nose!



This picture shows a close-up of taste buds on a tongue. Shutterstock



When it comes to tasting flavour, your nose helps a lot. Flickr/Bruce Tuten, CC BY

Curious Kids: How are mountains formed?

Author: **Patrice Rey**

Associate Professor, School of Geosciences, University of Sydney

The Conversation December 31, 2018

AVID's Critical Reading Process

This lesson will follow AVID'S reading process and will utilise the following strategies:

1. Pre-reading - Building vocabulary
2. Interacting with the text
3. Extending beyond the text

AVID's WICOR Methodology

This lesson utilizes the **WICOR** methodology.



The **WICOR** icon will be used throughout the lesson to communicate when an activity is using WICOR methods.

Writing Inquiry Collaboration Organization Reading



Cornell Notes

Essential Question:

How do readers actively read and isolate essential information in a text?

First Reading

- "Marking the Text: Circling and Underlining Essential Information"
- Identify and underline information relevant to the writing task

Second Reading

- "Writing in the Margins: Summarizing and Clarifying Ideas"
- Explain what the author is saying in select paragraphs.

Reading Prompt:

In this text, the author responds to a question from a student about how mountains are formed. As you read the text, highlight the information that explains how mountains are formed. To assist with providing a summary of the text, make notes beside each paragraph using your own words that describes what the author is saying.

Estimated Preparation Time:

30 minutes

Estimated Instructional Time:

150 minutes

Recommended Pacing:

2-3 days

Using the AVID Resources

Teacher Resources

This page offers strategies and approaches that will help you prepare for the lesson, set expectations, and prepare for the reading.



Pre-Reading

Developing Students' Understanding of the Subject

(approximately 20 minutes)

- Discuss with students what they know about mountains. What mountains or mountain ranges do they know or have heard of?
- <https://www.youtube.com/watch?v=tL2d7K1gKwI> 12.56 mins A video clip of mountains and ranges around the world

Building Vocabulary: Vocabulary Awareness Chart

(approximately 30 minutes)

(student handout attached)

This strategy allows students to comfortably assess their knowledge of vocabulary words before reading a text. It provides students with the opportunity to chat about and note definitions of unfamiliar words. Provide students with the handout with examples from below included. You may like to add other words according to the needs of your students. Ask students to complete the chart. Allow time for students to talk and share their recordings. If necessary, provide time to adjust their notes after discussion.

Vocabulary examples may include:

- continental crust
- lithosphere
- asthenosphere
- discovery
- geologists
- tectonic plates
- stunning
- plateau
- continental drift

The Write Path 1 English Language Arts: Exploring Texts with Strategic Reading pp 132-3



Interacting with the Text

Re-reading strategies

Marking the text: Non-Fiction

Allow students to view a screened copy of the text to model and support the following activities:

Numbering the Paragraphs

(approximately 5 minutes)

Note: Students familiar with the 'Marking the Text' strategy may be able to mark the text during their first read. If not, have students read the text once without marking the text.

1. Go over the 'Marking the Text' strategy with your students. Students should have copies of this handout on their desks or the ideas from this handout should be available to them in some other way.
2. Begin with **numbering the paragraphs**. If students are not familiar with numbering paragraphs, we will need to support this through a call and response method: the teacher calls out the paragraph number and students respond with the first two words of the paragraph.

First Read: Circling Key Terms and Underlining Essential Information

(approximately 15 minutes)

Note: Depending on your students' skill levels, you may want to work through a few paragraphs as a class. You might also reduce the amount of rereading students do by directing them to specific paragraphs that contain essential information about how mountains are formed. Consider having your students work in pairs as they learn how to circle key terms and underline essential ideas in a text.

The Write Path 1 English Language Arts: Exploring Texts with Strategic Reading pp 157-161

Summarising Informational Text

(approximately 40 minutes)

(student handout attached)

Steps in Summarising Informational Texts: (as set out in the handout)

Students will already have completed Steps 2 and 3.

- Step 1 Seek to understand the reading and writing task. What are you expected to know and do? What are you summarising? What is the purpose in reading this text?

- Step 2 Carefully read the text. Number the paragraphs or sections. Read the text once to get a general idea of what the text is about. Avoid getting bogged down in all the details. Read for the big ideas and the structure. Is this a scientific process, a description of a group, an analysis of an experiment, or some other scientific purpose?

- Step 3 Reread and mark the text. Circle the terms and underline the information relevant to the reading and writing tasks.

- Step 4 Pause to connect ideas within the text. Chart individual paragraphs in order to gain insight into the details. What visuals (charts, diagrams, and pictures) help to "see" what the author is saying? How does this idea connect to that idea?

- Step 5 Write summary statements for each paragraph in the margin. What is the main idea of this paragraph or section? What are the ideas that support this main idea? If this is a process, what are the big steps? If this is a description, what are the most important features? If this is an experiment, what is the design and what were the results?

- Step 6 Write final summary. Use the tips on the list that follows.

Tips for Writing Summaries of Text

- Present ideas in an order that makes sense, starting with the main idea.
- Refer to your markings on the text when writing the summary.
- Use accurate verbs to describe the information. Active verbs are preferred over passive verbs.
- Include important vocabulary, using the class discussion as a guide for the key words.
- Use your own words in paraphrasing the information. Do not quote directly from the text.
- It is okay to use an idea that is not yours. Remember to cite it appropriately in the text using MLA or APA style as directed by your teacher.
- Limit the length of your summary to one-quarter to one-third the original length of the text.
- Reread your summary for clarity and accuracy.



Extending beyond the Text

One-Pager

(approximately 40 minutes)

Complete a one-pager (as described below).

Guidelines:

- Use a standard piece of paper for all students
- Fill the entire page
- Written work must be printed
- Use colour as much as possible
- Include ALL the following:
 - Title and author
 - Three or more excerpts from the text that you think are important
 - A personal response to each excerpt selected
 - One or more graphic representations
 - Add a border or any other decoration

When finished, students place their one-pager on the wall with others and explain their one-pager orally.

SAMPLER

Student Handout - Vocabulary Awareness Chart—Prior to Reading

Vocabulary for (title): How are mountains formed?

[illegible]

Student Handout: Steps in Summarizing Informational Texts

Step 1	Seek to understand the reading and writing task. <i>What are you expected to know and do? What are you summarizing? What is the purpose in reading this text?</i>
Step 2	Carefully read the text. <i>Number the paragraphs or sections. Read the text once to get a general idea of what the text is about. Avoid getting bogged down in all the details. Read for the big ideas and the structure. Is this a scientific process, a description of a group, an analysis of an experiment, or some other scientific purpose?</i>
Step 3	Reread and mark the text. <i>Circle the terms and underline the information relevant to the reading and writing tasks.</i>
Step 4	Pause to connect ideas within the text. <i>Chart individual paragraphs in order to gain insight into the details. What visuals (charts, diagrams, and pictures) help to “see” what the author is saying? How does this idea connect to that idea?</i>
Step 5	Write summary statements for each paragraph in the margin. <i>What is the main idea of this paragraph or section?</i> <i>What are the ideas that support this main idea? If this is a process, what are the big steps? If this is a description, what are the most important features? If this is an experiment, what is the design and what were the results?</i>
Step 6	Write final summary. Use the tips on the list that follows.

Tips for Writing Summaries of Text

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- Limit the length of your summary to one-fourth to one-third the original length of the text.
- Reread your summary for clarity and accuracy.

Curious Kids: how do mountains form?

Author: Patrice Rey

Associate Professor, School of Geosciences, University of Sydney

December 31, 2018

Hello Astrid. You may not believe this but when I was about your age my teacher (Mr Rouve) explained to the class how mountains get made.

He took a sheet of paper and put it flat on the table. Then, he put the tips of his right and left hands' fingers on each side of the flat sheet and slowly moved his hands toward each other. Try to do it and you will see that the middle part of the paper will lift off the table to form a nice fold.

My teacher explained that mountains form in a similar way, when flat layers of rocks are pushed toward each other they move upward forming tall mountains.

<https://www.youtube.com/watch?v=ngV66m00UvU>
– Video clip of how mountains are formed

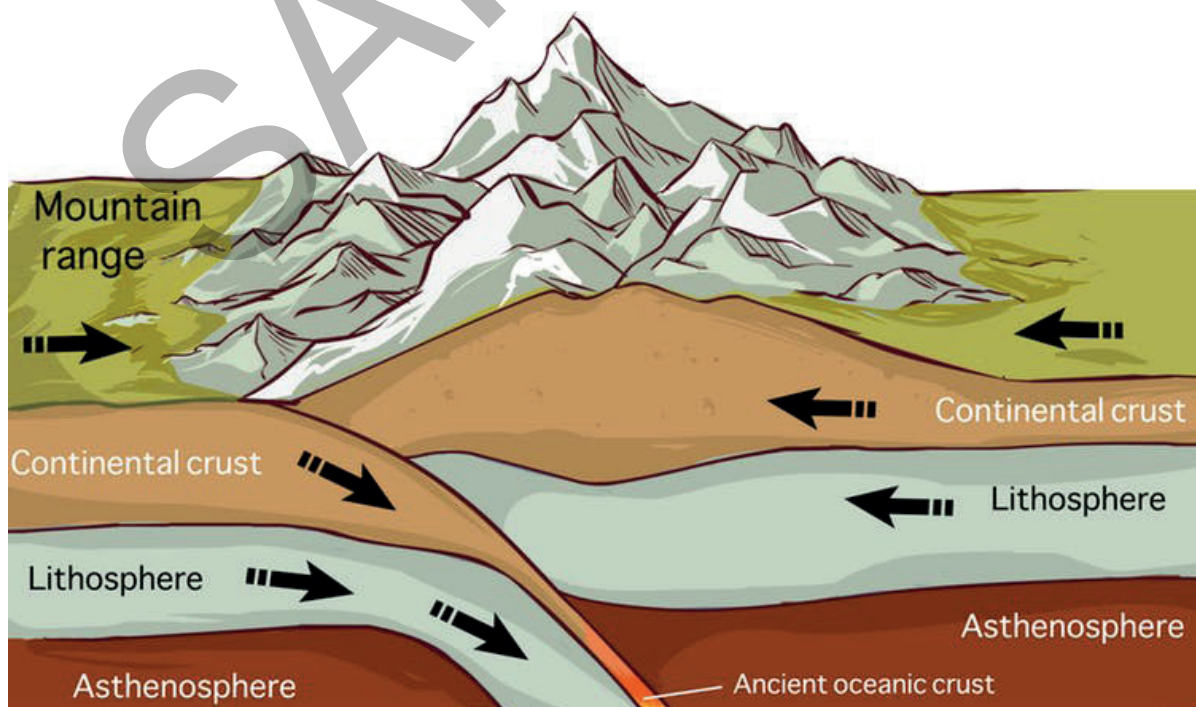
My teacher was really excited by a discovery made by geologists at that time, when I was a kid. These geologists had figured out that the surface of the Earth was, like a giant jigsaw puzzle, made

of pieces. Those pieces, called “tectonic plates”, move and bump into each other.

This bumping creates earthquakes, which slowly push the ground surface upward to make mountains. It happens so slowly that, in fact, you are getting taller faster than mountains do, except mountains keep growing and growing and growing for many millions of years until they are so heavy they can no longer grow taller, only wider.

<https://www.youtube.com/watch?v=KeRb6JfKwKQ>
– Video clip - Nat Geo simulation of mountains forming.

In fact, Australia and New Zealand are sitting on two different “tectonic plates” that move towards each other at the speed of a few centimetres per year. Where they bump into each other, the ground gets lifted to form the stunning New Zealand Alps, the top of which stands close to 4,000 metres. Can you imagine about 4,000 people as tall as you, standing straight up on each other shoulders? That's how tall these mountains are.



Mountains also form when the Earth's crust is pushed upward from underneath. Shutterstock

Mountains also form when the Earth's crust is pushed upward from underneath. At the same time the New Zealand Alps started to form, a large hot bubble of rocks raising from deep in the Earth, like a giant air balloon, was pushing upward the surface of the eastern part of Africa forming a 4,000 metre high plateau. This plateau split to form what is known as the East African Rift, a valley twice as long as the New Zealand Alps.

There are many mountains at the surface of the Earth. Some we can see, some we can't because they are under the sea. If you could take a submarine and dive under the sea, for instance in the ocean in between Australia and Antarctica, you could visit a long mountain where the Australian and Antarctica tectonic plates move away from each other.

Thank you again for your fantastic question.

SAMPLER

Here's how a 100% renewable energy future can create jobs and even save the gas industry

Author: **Sven Teske**

Research Director, Institute for Sustainable Futures, University of Technology Sydney

The Conversation, January 24th 2019

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3. Extending beyond the text

AVID's WICOR Methodology

This lesson utilizes the **WICOR** methodology.



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Writing Inquiry Collaboration Organization Reading



Cornell Notes

Essential Question:

How do readers actively read and isolate essential information in a text?

First Reading

- "Marking the Text: Circling and Underlining Essential Information"
 - Numbering paragraphs
 - Identify and underline information relevant to the writing task

Second Reading

- "Charting the text structure"
 - Explain what the author is saying and doing using select paragraphs.

Reading Prompt:

The text, '**Here's how a 100% renewable energy future can create jobs and even save the gas industry**', Teske informs readers about recent research undertaken. As you read the text underline the essential information in each paragraph that will be used to construct notes for charting the micro-structure of the text.

Estimated Preparation Time: 30 minutes

Estimated Instructional Time: 225 minutes

Recommended Pacing: 4-5 days

Using the AVID Resources

Teacher Resources

This page offers strategies and approaches that will help you prepare for the lesson, set expectations, and prepare for the reading.



Pre-Reading

Developing Students' Understanding of the Subject

(approximately 20 minutes)

- <https://www.youtube.com/watch?v=uStFvcz9Or4> – 13.11 mins. Video of Top 10 future energy sources
What do students know about energy production?
 - fossil fuels
 - solar / wind etc.
 - what are some of the problems facing Earth in relation to energy production?

- Identify ten words that seem important (for instance, words that are essential to the topic, content vocabulary, or key concepts).
- Write the selected words in the “Word” column.
- Assess your own knowledge of each word by placing a checkmark in the column that best represents your understanding of each word. Use a dictionary to look up the words that you do not know.

*Critical Reading: Deep Reading Strategies for Expository Texts
Teacher Guide pp 36-42*

Prereading: Working Inside a Text

(approximately 30 minutes)

(student handout attached)

This task will teach students to use features such as titles, visuals, and other reading aids to help them develop a basic understanding of the text. Teachers might like to model each of these strategies prior to students attempting the task on their own or in pairs:

Surveying the text:

Ask students to survey the text. Have them report on what they see. Are there subtitles? What is the length of the text / paragraphs?

Noting Organisational Signals:

Have students note the layout etc.

Predicting the Main Idea:

Students can read the title and make predictions about the main idea.

Predicting the Genre:

Students can make predictions about the genre as they are completing the above activities.

Provide time for students to share their responses either in small groups or as a whole class.

Vocabulary examples from the text may include:

- renewable energy
- technological fixes
- carbon capture
- collaboration
- transition fuel
- infrastructure
- obsolete
- electrification
- conversion
- synthetic
- negative emissions
- carbon budget
- potential
- grid infrastructure
- hydrogen
- methane
- synthetic fuels
- Paris Agreement

*Critical Reading: Deep Reading Strategies for Expository Texts
Teacher Guide pp14-16*

Building Vocabulary

Vocabulary Awareness Chart

(approximately 45 minutes)

(student handout attached)

Students complete the handout. Encourage them to locate words and phrases they are not familiar with. Also ask them to use context clues to support their efforts. Phrases have also been included in the suggested list as the words on their own do not necessarily convey the correct meaning.

- Scan the title, subtitles, captions, reading aids, and first and last paragraphs.



Interacting with the Text

Re-reading strategies

Instructions for the lesson are provided in this section. Allow students to view a screened copy of the text to model and support the following activities:

Numbering the Paragraphs

(approximately 10 minutes)

Note: Students familiar with the 'Marking the Text' strategy may be able to mark the text during their first read. If not, have students read the text once without marking or writing in the margins.

1. Go over the 'Marking the Text' strategy with your students. Students should have copies of this handout on their desks or the ideas from this handout should be available to them in some other way.
2. Begin with **numbering the paragraphs**. If students are not familiar with numbering paragraphs, we will need to support this through a call and response method: the teacher calls out the paragraph number and students respond with the first two words of the paragraph.

First Read: Circling and Underlining Essential Information

(approximately 20 minutes)

Note: Depending on your students' skill level, you may want to work through a few paragraphs as a class. You might also reduce the amount of rereading students do by directing them to specific paragraphs that contain essential information. Consider having your students work in pairs as they learn how to circle and underline essential ideas in a text.

Ask students to focus on the author's claims and evidence as they complete this activity.

Charting the Text – Analysing the Micro-Structure

(approximately 40 minutes)

(teacher reference attached with student handout included)

Although this strategy may be difficult for many readers, with practise students will be able to distinguish between what an author is saying in a particular paragraph and what an author is doing in that same paragraph. When we refer to what an author is saying, we are generally concerned with the "what." And when we refer to what an author is doing, we are interested in the author's actions. That is, when we chart what an author is saying, we focus on the actual content of a paragraph; when we chart what an author is doing, we focus on the deliberate choices authors make when constructing meaningful paragraphs. Over time, students will become more adept at distinguishing between what an author is saying and what an author is doing, and as they become more familiar with this strategy, you will find that their reading comprehension will improve and you will have richer discussions of texts.

It is important that teachers model this process before asking students to complete the table.

For example:

Paragraph Number	What the author is saying	What the author is doing
	Below are some questions you should ask: What is this section about? What is the content? What did I learn from this paragraph? What information is being presented?	Here are some examples of what authors do: Giving an example... Interpreting data... Sharing an anecdote... Summarizing information... Reflecting on a process...
1	The author is saying that our global energy supply can move to 100% renewable energy by 2050.	The author is introducing readers to the research carried out by organisations into future energy and how we can achieve sustainability along with employment.

*Critical Reading: Deep Reading Strategies for Expository Texts
Teacher Guide pp 97-113*

Interpreting and Analysing Line and Bar Graphs

(approximately 30 minutes)

This text has a graph explaining the relationship between a projected increase in the types of energy production and the impact on employment.

Data is often presented in the form of line and bar graphs and it is therefore important to teach students a strategy they can use to analyse this data in order to reach conclusions.

Instructions:

- Choose appropriate questions for the chart or graph that is being analysed.
- Identify the title of the graph. This usually indicates what to look for in the graph; when two subjects are shown, a relationship exists.

- What does the source of information in the graph suggest about its reliability?
- What does the left side (vertical axis) of the graph show?
- What does the bottom (horizontal axis) of the graph indicate?
- If a legend exists, what do the symbols represent?
- Based on information from the graph, explain what comparisons, trends, or patterns you predict over time.
- Summarise what you have learned from this graph.
- What inferences can be made from the data in this graph?
- What question(s) is not addressed by the graph that would allow for a better understanding of the topic?



Extending Beyond the Text

GIST Summary

(approximately 30 minutes)

(student handout attached)

Gist is a word that means “the essence.” A GIST summary conveys the meaning of the scientific concept, event, experiment, or theory without including all of the details. When you can summarise the main points in your own words, you are one step closer to mastery of the concept.

Include the following in a GIST summary:

- Explain what you are summarising.
- Describe the concept that you are learning about.
- Highlight or write five key phrases/words that encompass what the notes are about.
- Use your five key phrases/words to write three to five complete sentences that summarise your notes.

Check your summary to be sure that the details support the topic from your notes.

OR

One-Pager

(approximately 40 minutes)

Complete a one-pager (as described below).

Guidelines:

- Use a standard piece of paper for all students
- Fill the entire page
- Written work must be printed
- Use colour as much as possible
- Include ALL the following:
 - Title and author
 - Three or more excerpts from the text that you think are important
 - A personal response to each excerpt selected
 - One or more graphic representations
 - Add a border or any other decoration

When finished, students place their one-pager on the wall with others and explain their one-pager orally.

Student Handout - Vocabulary Awareness Chart

- Scan the title, subtitles, captions, reading aids, and first and last paragraphs.
- Identify ten words that seem important (for instance, words that are essential to the topic, content vocabulary, or key concepts).
- Write the selected words in the “Word” column.
- Assess your own knowledge of each word by placing a checkmark in the column that best represents your understanding of each word. Use a dictionary to look up the words that you do not know.

Word	Know It	Seen It; Do Not Know It	No Idea	Definition or Notes for Those Words that You Do Not Know
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Which words above were the most challenging? Why?

Student Handout - GIST Summary

Gist is a word that means “the essence.” A GIST summary conveys the meaning of the scientific concept, event, experiment, or theory without including all of the details. When you can summarize the main points in your own words, you are one step closer to mastery of the concept.

Include the following in a GIST summary:

- Explain what you are summarizing.
- Describe the concept that you are learning about.
- Highlight or write five key phrases/words that encompass what the notes are about.
- Use your five key phrases/words to write three to five complete sentences that summarize your notes.
- Check your summary to be sure that the details support the topic from your notes.

Topic: _____

Main idea of concept (complete sentence): _____

Five key phrases/words (in your own words) that explain what the notes or text are about:

1. _____

2. _____

3. _____

4. _____

5. _____

Write a paragraph (3–5 sentences, or 20 words) using the key phrases/words to summarize the “gist” of this concept.

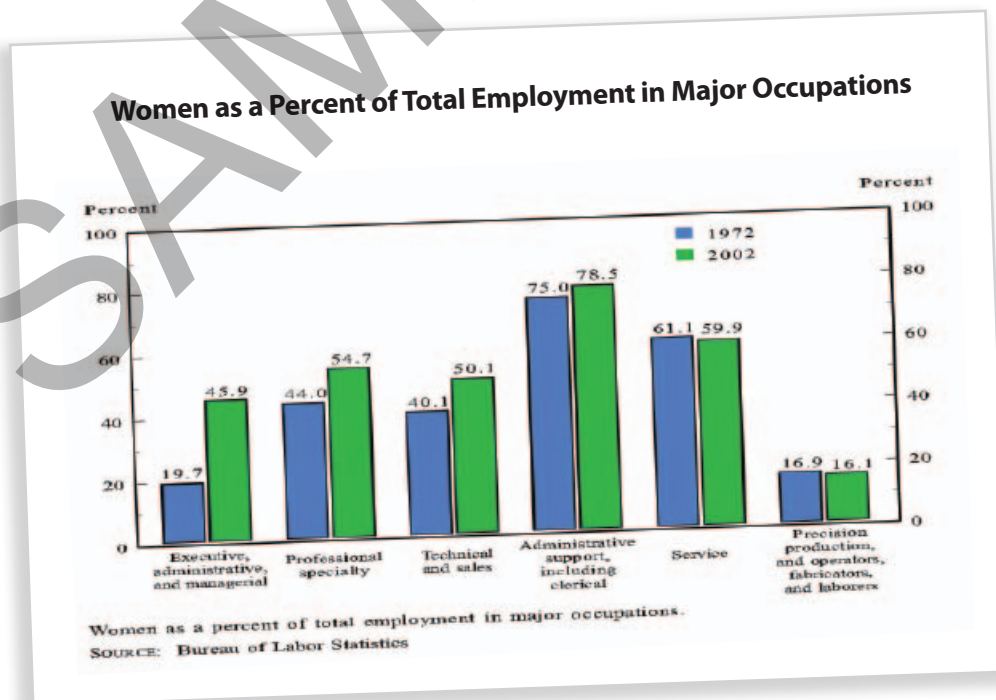
Student Handout - Interpreting and Analyzing Line and Bar Graphs

Data is often presented in the form of line and bar graphs and it is therefore important to teach students a strategy they can use to analyze this data in order to reach conclusions.

Instructions:

1. Choose appropriate questions for the chart or graph that is being analyzed.
2. Identify the **title** of the graph. This usually indicates what to look for in the graph; when two subjects are shown, a relationship exists.
3. What does the **source of information** in the graph suggest about its reliability?
4. What does the left side (**vertical axis**) of the graph show?
5. What does the bottom (**horizontal axis**) of the graph indicate?
6. If a **legend** exists, what do the symbols represent?
7. Based on information from the graph, **explain** what comparisons, trends, or patterns you predict over time.
8. **Summarize** what you have learned from this graph.
9. What **inferences** can be made from the data in this graph?
10. What **question(s)** is not addressed by the graph that would allow for a better understanding of the topic?

SAMPLE GRAPH



Student Handout - Prereading: Working Inside a Text

Use the questions and/or instructions in the left column to guide your *Prereading*. Record your responses in the right column.

Surveying the Text

What is the title of the text?	
Who is the author?	
Describe any visuals contained in the section you have been asked to read.	
Provide some comments about the text (e.g., length, number of paragraphs, layout, visuals, etc.).	

Noting Organizational Signals

Briefly describe the layout of the text, observing title, subtitles, sections, and page breaks.	
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Predicting the Main Idea

Read the title of the text and make predictions about the main idea. What will this text be about?	
Now, read the first and last paragraphs. What do you know about the text that you didn't know before?	

Predicting the Genre

What do you know about this genre?	
How will the text be shaped and developed?	

Here's how a 100% renewable energy future can create jobs and even save the gas industry

Author: **Sven Teske** Research Director, Institute for Sustainable Futures, University of Technology Sydney
The Conversation, January 24th 2019



Photo courtesy of Tod Baker - Flickr

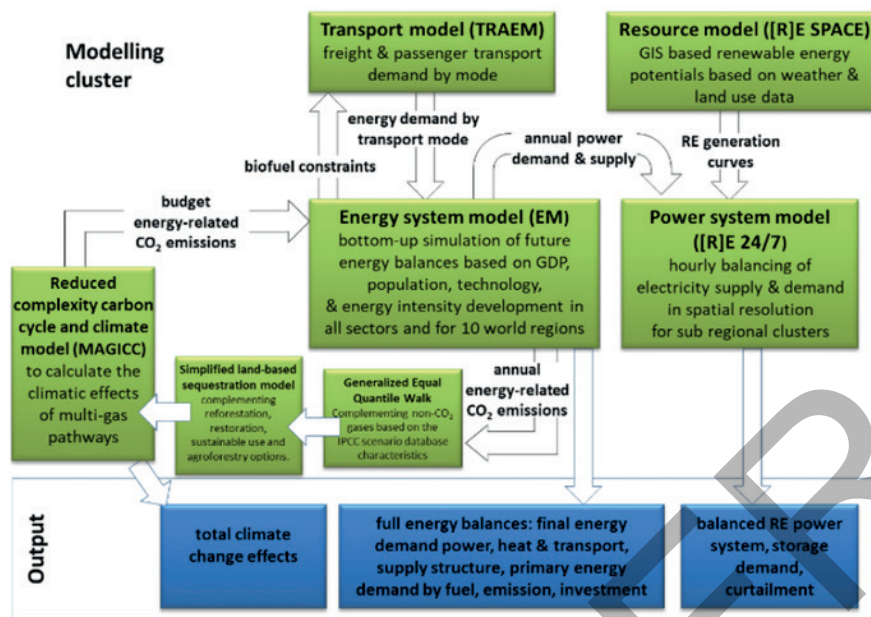
The world can limit global warming to 1.5°C and move to 100% renewable energy while still preserving a role for the gas industry, and without relying on technological fixes such as carbon capture and storage, according to our new analysis. The One Earth Climate Model – a collaboration between researchers at the University of Technology Sydney, the German Aerospace Centre and the University of Melbourne, and financed by the Leonardo DiCaprio Foundation – sets out how the global energy supply can move to 100% renewable energy by 2050, while creating jobs along the way. It also envisions how the gas industry can fulfil its role as a “transition fuel” in the energy transition without its infrastructure becoming obsolete once natural gas is phased out.

Our scenario, which will be published in detail as an open access book in February 2019, sets out how the world's energy can go fully renewable by:

- increasing electrification in the heating and transport sector
- significant increase in “energy productivity” – the amount of economic output per unit of energy use
- the phase-out of all fossil fuels, and the conversion of the gas industry to synthetic fuels and hydrogen over the coming decades.

Our model also explains how to deliver the “negative emissions” necessary to stay within the world's carbon budget, without relying on unproven technology such as carbon capture and storage.

If the renewable energy transition is accompanied by a worldwide moratorium on deforestation and a major land restoration effort, we can remove the equivalent of 159 billion tonnes of carbon dioxide from the atmosphere (2015-2100).



Interactions between the models used for the One Earth Model. One Earth Model, Author provided

Combining models

We compiled our scenario by combining various computer models. We used three climate models to calculate the impacts of specific greenhouse gas emission pathways. We then used another model to analyse the potential contributions of solar and wind energy – including factoring in the space constraints for their installation.

We also used a long-term energy model to calculate future energy demand, broken down by sector (power, heat, industry, transport) for 10 world regions in five-year steps. We then further divided these 10 world regions into 72 subregions, and simulated their electricity systems on an hourly basis. This allowed us to determine the precise requirements in terms of grid infrastructure and energy demand.

‘Recycling’ the gas industry

Unlike many other 1.5°C and/or 100% renewable energy scenarios, our analysis deliberately integrates the existing infrastructure of the global gas industry, rather than requiring that these expensive investments be phased out in a relatively short time.

Natural gas will be increasingly replaced by hydrogen and/or renewable methane produced by solar power and wind turbines. While most scenarios rely on batteries and pumped hydro as main storage technologies, these renewable forms of gas can also play a significant role in the energy mix.

In our scenario, the conversion of gas infrastructure from natural gas to hydrogen and synthetic fuels will start slowly between 2020 and 2030, with the conversion of power plants with annual capacities of around 2 gigawatts. However, after 2030, this transition will accelerate significantly, with the conversion of a total of 197GW gas power plants and gas co-generation facilities each year.

Along the way the gas industry will have to redefine its business model from a supply-driven mining industry, to a synthetic gas or hydrogen fuel production industry that provides renewable fuels for the electricity, industry and transport sectors. In the electricity sector, these fuels can be used to help smooth out supply and demand in networks with significant amounts of variable renewable generation.

A just transition for the fossil fuel industry

The implementation of the 1.5°C scenario will have a significant impact on the global fossil fuel industry. While this may seem to be stating the obvious, there has so far been little rational and open debate about how to make an orderly withdrawal from the coal, oil, and gas extraction industries. Instead, the political debate has been focused on prices and security of supply. Yet limiting climate change is only possible when fossil fuels are phased out.

Under our scenario, gas production will only decrease by 0.2% per year until 2025, and thereafter by an average of 4% a year until 2040. This represents a rather slow phase-out, and will allow the gas industry to transfer gradually to hydrogen.

Our scenario will generate more energy-sector jobs in the world as a whole. By 2050 there would be 46.3 million jobs in the global energy sector – 16.4 million more than under existing forecasts.

Our analysis also investigated the specific occupations that will be required for a renewables-based energy industry. The global number of jobs would increase across all of these occupations between 2015 and 2025, with the exception of metal trades which would decline by 2%, as shown below.

However, these results are not uniform across regions. China and India, for example, will both experience a reduction in the number of jobs for managers and clerical and administrative workers between 2015 and 2025.

Our analysis shows how the various technical and economic barriers to implementing the Paris Agreement can be overcome. The remaining hurdles are purely political.



Division of occupations between fossil fuel and renewable energy industries in 2015 and 2025. One Earth Model, Author provided