Earth Topic 4

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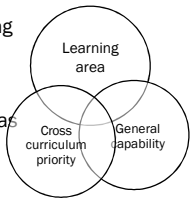
Topic 4 Objectives

Students will be able to:

- Outline the key aspects of the new Australian Curriculum.
- Outline key aspects of the focus and content of the Earth and Space strand of the Australian science curriculum and provide examples of appropriate content contexts
- Explore, understand, critique and teach various conceptions in the area of Earth and space, including rock cycle, weathering, erosion and soils.

•The Australian Curriculum

- sets what all students are to be taught (content) and the quality of learning expected by years or bands of schooling (achievement standards)
- affirms the central importance of discipline-based knowledge and skills as well as general capabilities and cross-curriculum priorities



A curriculum for all young Australians
A world-class curriculum for the 21st century

4

Learning Area Structure Foundation

Rationale and aims

- outline the purpose and structure of the learning area

Content descriptions

- core knowledge, understandings and skills – what students will be taught
- accompanied by content elaborations that illustrate and exemplify content

Achievement standards

- describe the learning typically expected of students
- accompanied by work samples that illustrate and exemplify

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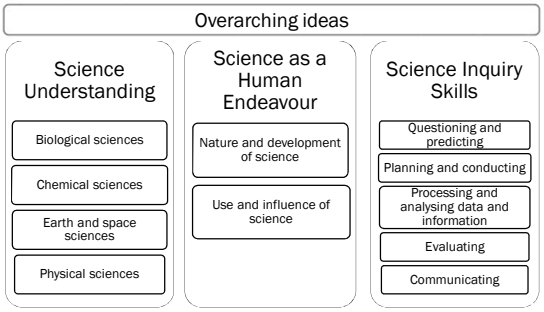
Science - Organisation



Science Understanding

- Biological sciences
- Chemical sciences
- Earth and space sciences
- Physical sciences

- core content
- conceptual development across and over sub-strands
- key concepts identified in 'Organisation' section
- year by year bands

Science as a Human Endeavour

- Nature and development of science
- Use and influence of science

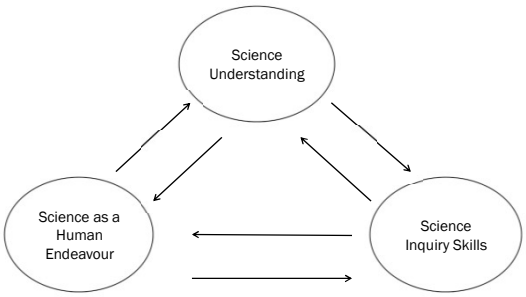
- the unique nature of science and scientific knowledge
- development of scientific knowledge
- how science knowledge and applications affect peoples' lives
- how science is influenced by society
- how science informs decision making
- two-yearly bands

Science Inquiry Skills

- Questioning and predicting
- Planning and conducting
- Processing and analysing data and information
- Evaluating
- Communicating

- evaluating claims
- investigating ideas
- solving problems
- drawing valid conclusions
- developing evidence-based arguments
- broad notion of 'investigation'
- role of representation and discourses of science
- two-yearly bands

Connecting the three strands



Relationships Between the Strands

☺	☹
Science as a Human Endeavour can provide a context for learning	Science as a Human Endeavour becomes extra content
Science as a Human Endeavour can be used to engage students at a range of levels	Science as a Human Endeavour is just done 'once the other stuff is finished'
Content of the Science Understanding strand is learnt through inquiry methods	Science Inquiry Skills become separate content that 'has to be covered'
All strands are assessed and recorded	Only the Science Understanding strand is assessed formally

Year 6 learning

AC Content Description:

Sudden geological changes or extreme weather conditions can affect Earth's surface

Year 6 learning

Content Description:

Sudden geological changes or extreme weather conditions can affect Earth's surface

Key Ideas:

- Major geological events such as earthquakes, volcanic eruptions and tsunamis can occur in Australia and the Asia region
- Earthquakes can cause tsunamis
- People measure significant geological events including using scales for example the Richter scale
- Scientific understanding can assist in natural disaster management to minimise both long- and short-term effects
- Drought impacts on living and non-living aspects of the environment

Earth and Space Science

Year 1 Observable changes occur in the sky and landscape

Year 2 Earth's resources, including water, are used in a variety of ways

Year 3 Earth's rotation on its axis causes regular changes, including night and day

Year 4 Earth's surface changes over time as a result of natural processes and human activity

Year 5 The Earth is part of a system of planets orbiting around a star

Year 6 Sudden geological changes or extreme weather conditions can affect Earth's surface

Year 7 Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the sun, Earth and the moon

Year 6 Earth and Space Sciences
Overview

Big Idea:

The Earth is subject to change caused by natural processes and human use of resources

Prior learning linked to the Big Idea

Content Description:

Earth's surface changes over time as a result of natural processes and human activity (Year 4)

Students may have:

- identified the Earth's resources including water, soil and minerals, and describing how they are used in the school
- described how a resource such as water is transferred from its source to its point of use
- considered what might happen to humans if there were a change in a familiar available resource, such as water.

Year 6 learning

Content Description:

Sudden geological changes or extreme weather conditions can affect Earth's surface

Key Ideas:

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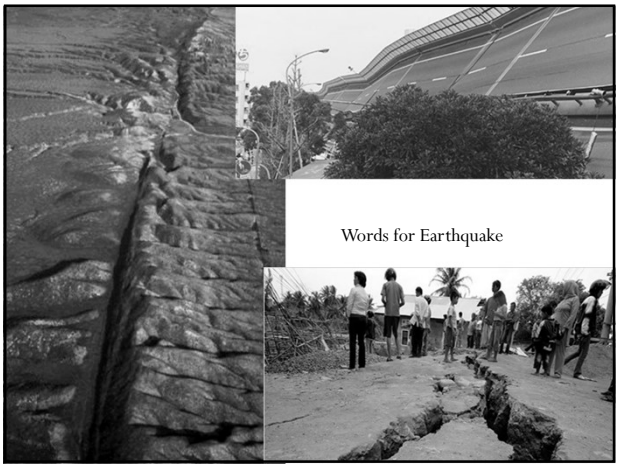
Future learning linked to the Big Idea

Content Description:

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (Year 8)

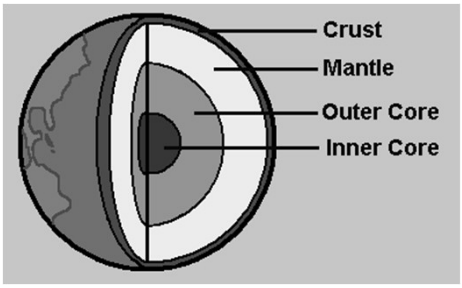
Key Ideas:

- Rocks and minerals are formed and changed over time as a result of heat and pressure
- The formation of rocks and minerals is a cyclical process that involves changes of state, weathering and erosion and deposition
- Rocks can be classified based on their observable properties

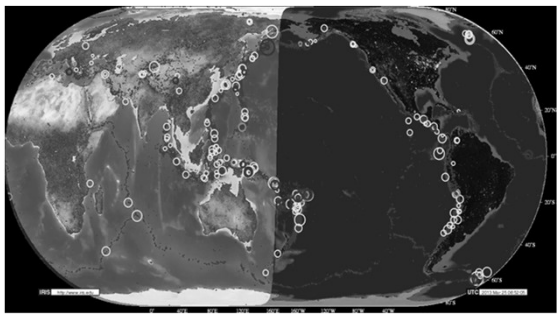


	Definitions and notes
Crust	The surface of the earth that covers the surface and can be covered by rock or water. It can be up to 8-10 km thick over land.
Core	The areas at the centre of the earth, the inner core is under high pressure and it very hot solid metal (iron/nickel). The outer layer is liquid metal, which moves and is liquid.
Tectonics	Crust of the earth is fragmented forming plates and constantly moving and this causes mountains, deep sea trenches and when it moves more violently causes earthquakes
Tornadoes	A small-scale atmospheric disturbance that is only metres in size and from one storm. Tornadoes are usually found forming over land
Cyclones	These are large atmospheric disturbances that cover hundreds of km in width and often form over water and can move over several days and even weeks. Intensity is measured in categories.
Mantle	The layer under the surface of the Earth. This is a solid at high temperature. (Because the components of the mantle include silicates which are ductile, there will be some flow of material through the mantle over a long time scale)
Volcano	Caused by break in the crust of the earth where molten lava and ash reach the surface of the earth.

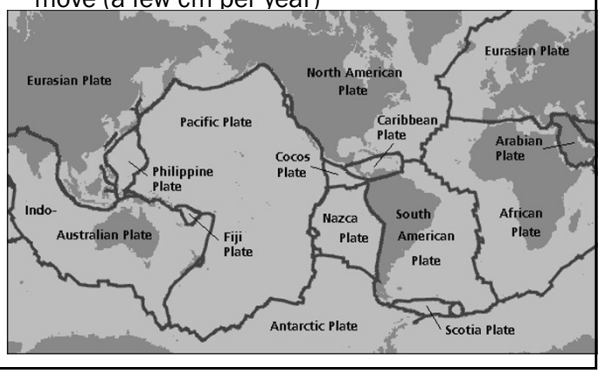
•Layers of the Earth



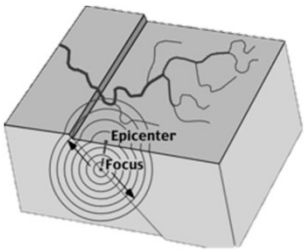
- **http://www.iris.edu/seismon/bigmap/index.phtml**



- **Tectonic Plates**
  - The tectonic plates float on the mantle and move (a few cm per year)

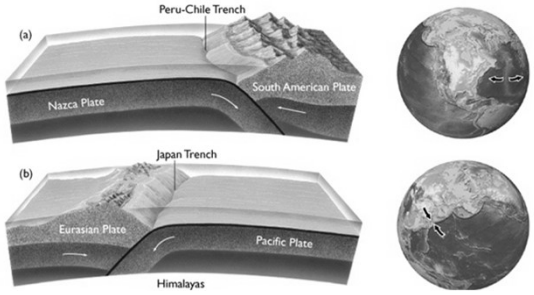


- **Earthquakes**
  - The movement of the crust causes stresses which may be released an earthquakes.



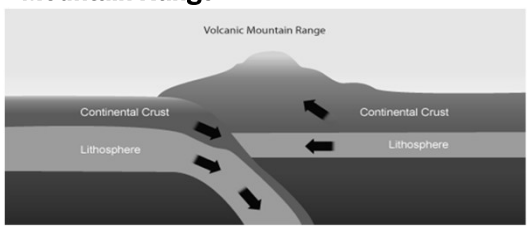
http://www.iris.edu/hq/retm

- **Deep Sea Trenches**

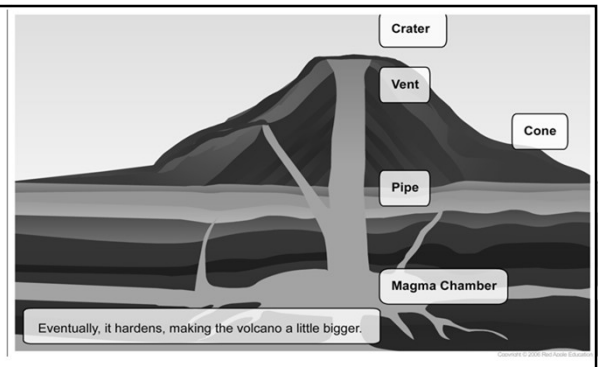


  - Where plates move apart – deep in mid ocean – molten material flows up to fill the gap

- **Mountain Range**



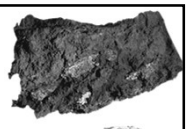
When plates collide mountain ranges are pushed up e.g. the Himalayas formed by India pushing up against southern Asia.

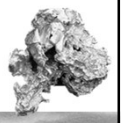


http://www.skwirk.com.au/esa/volcanoes.html

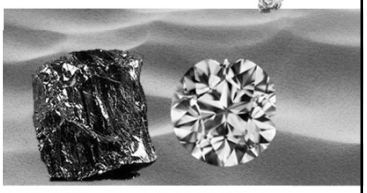
https://www.scootle.edu.au/ec/search?q=Science+earthquakes&field=title&field=text.all&field=topic&v=text

•Minerals

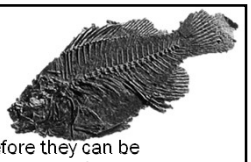




- Some rocks contain materials which are useful to us and these can be mined and processed. They include:
- Metal ores
- Non-metallic materials
- Fossil fuels



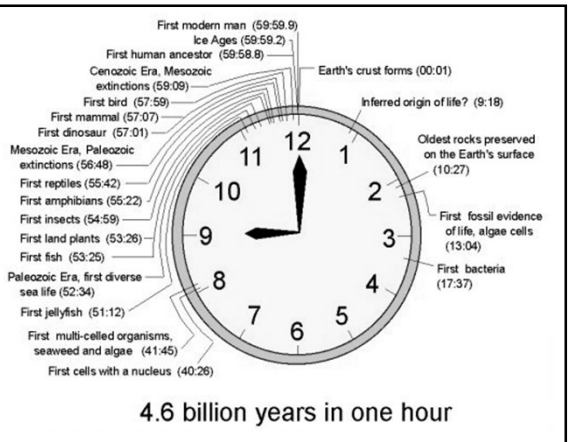
•Fossils



- **What is a fossil?**
- Remains of an animal are buried before they can be destroyed and decayed can get preserved as fossils

- **How are fossils formed?**

- Soft tissue, like ferns and skin and soft body parts or footprints, are usually preserved as imprints in
- muddy banks or soft clays.
- When the creature rots and disappears the imprint
- itself becomes a fossil.



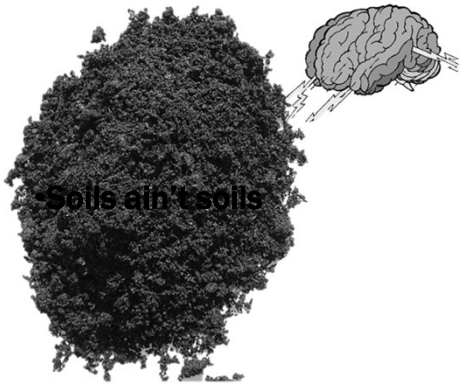
•Renewable Energy resources

Non renewable means

- Renewable
- Science is therefore looking for other sources of energy which can be continually replenished. These include:
  - .....

Possible Activities

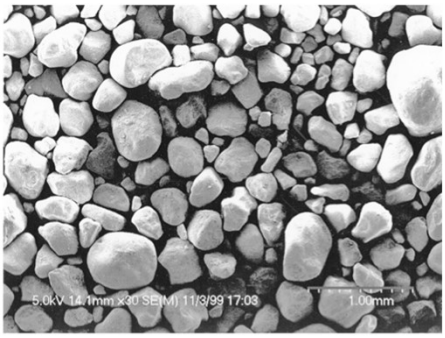
Earthquake panic	**Create a movie to show an earthquake and think of the consequence of an earthquake in your street. What might be damaged and what would be the consequence.**
Tectonic event	Students visit the Scootle site and complete the simulation of the tectonic plates and how scientists years ago were able to determine the composition of the inner core and outer core by inference
Drought	Examine the rainfall over a decade and visit the local dams and water centre, how do we manage our water as a natural finite resource? Resources from the water authority including videos and worksheets
Fire	Fire is another natural possible disaster, this needs to be handled sensitively for students especially if a fire has impacted on them or their family. It is a useful to consider what causes fires and how the fire triangle conditions must be met. Consideration could be given to fire prevention and a visit from local fire fighters



•Soil Activities

- C – Composition – granularity
- C – Content (humus and minerals)
- C – Colour
- C – Chemical – pH
- P - Permeability

•1 Soil Composition



• Grain size - Udden-Wentworth scale

Phi Units*	Size	Wentworth Size Class	Sediment/Rock Name
-8	256 mm	Boulders	Sediment: GRAVEL Rock: RUDITES: (conglomerates, breccias)
-6	64 mm	Cobbles	
-2	4 mm	Pebbles	
-1	2 mm	Granules	
0	1 mm	Very Coarse Sand	Sediment: SAND Rocks: SANDSTONES (arenites, wackes)
1	1/2 mm	Coarse Sand	
2	1/4 mm	Medium Sand	
3	1/8 mm	Fine Sand	
4	1/16 mm	Very Fine Sand	
8	1/256 mm	Silt	Sediment: MUD Rocks: LUTITES (mudrocks)
		Clay	

* Udden-Wentworth Scale

•2 Soil Content - Humus

- Humus is rotting animal and plant material and will float when water is first added.
- Put a small sample of each soil type into a test tube, add water and shake. Estimate the fraction of each sample which was humus by seeing how much floats (humus) and how much sinks (mineral)

•3. Colour and appearance

The colour of the soil indicates which minerals might be present.

•4. Minerals

•5 Plant and Animal content

- Use a hand lens to examine the dishes with the samples of peat and potting mix for animal faeces, body parts and plant remains such as leaves and bark. You can use sticky tape to attach some of the sample to your paper.

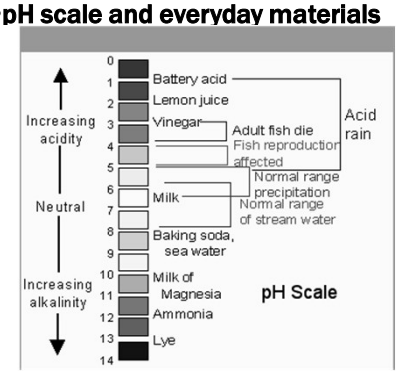
•6 Soil Chemistry

- Different plants prefer different acidity levels
- The level of acidity is called the pH and
- a pH of 7 is neutral (pure water).
- Acids have a low pH (down to zero) and
- Alkaline have a pH between 7 and 14
-
- You are to use the universal indicator to measure the pH of your soil samples.

•Measuring pH

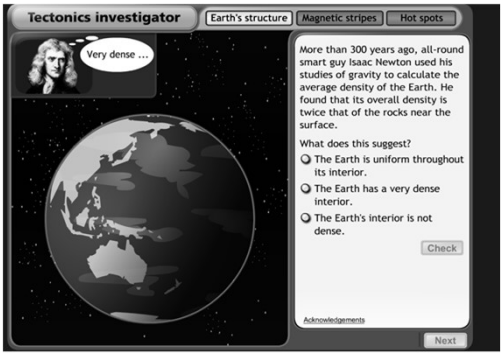
- Use the samples on paper in the dishes.
- Add ten drops of water to sample – any soluble material in the sample will form a solution and be absorbed by the filter paper.
- Add one drop of the universal indicator to each sample and note any colour changes.
- The chart on the next slide should enable you to estimate the pH of each soil sample.

•pH scale and everyday materials



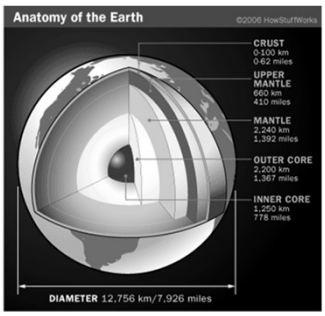
•Resources

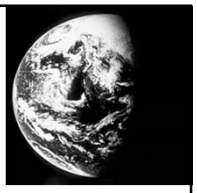
Tectonic



http://www.scootle.edu.au/ec/viewing/L5826/index.html

•Earth





•Let's play cahoot

- Get out your device and https://kahoot.it/#/

https://play.kahoot.it/#/k/68ccc22a-e668-4bdd-8d1d-a7fd468929e8

•Assignment 2 (Total 40%): A child's ideas about a science concept:

PART	Section	%	In class	Completed
A	Research	5	Week 1	
B	Investigating	10	Week 3	
C	Reporting	10	Week 4	
D	Activities & video	10	Week 4	
E	Reflection	5	Week 5	
	Total	40		

•Part C Reporting on a Child's Thinking 10% (suggested 700- 900 words)
On the proforma complete the following table to present your findings and discussion

What is Demonstrated Science concepts and misconceptions the child holds	How you know Example taken from transcript include line number) links to relevant academic literature

Part D Application Activities to Advance a Child's Understanding 10% (suggested 200 words)

Suggest **2 activities** that could address this child's misconceptions so as to progress her/his science learning.

You need to create

1) One activity should be recorded as a 1-2 min video you need to state the misconception, demonstrate the activity and record it
2) Use the proforma to present your other activity in this format

Whilst it is accepted that you will take your activity ideas from other sources, you must adapt them, not merely drop in a full activity from elsewhere.

Learning Experience	Misconceptions	Outline of Learning Experiences
Sun walk and shadow play	Tom believed that light only came from electricity (torch or lights in the street or home) (Appendix 2, lines 11-18) Tom did not know how a shadow was made (Appendix 2, lines 27-30)	Discussion about shadows • Discuss what student knows about shadows and how they are made. Go outside and 'find' a shadow. • Discuss how the sun creates the shadow. • Move around and take pictures of student and their shadow. • Pose body in different ways to photograph how the shadow changes as the body does. Review what student has learnt and show him the following YouTube clip that shows amazing hand shadows http://www.youtube.com/watch?v=DLc6FoSYuMc