

# **DYNAMIC EARTH**

**An Earth and Space  
Sciences unit for  
Year 6**

# TABLE OF CONTENTS

<b>CONTENT</b>	<b>PAGES</b>
Backward Unit Planner.....	3-4
Unit at a glance - Dynamic Earth.....	5
Dynamic Earth Alignment with the Australian Curriculum: Science.....	6
Alignment with Australian Curriculum: English and Maths .....	7
Alignment with Australian Curriculum General Capabilities.....	8-9
Cross curriculum Priorities .....	10
Teacher background information.....	11
Key Misconceptions regarding plate tectonics volcanoes earthquakes and tsunamis .....	12-13
<b>LESSON PLANS</b>	
Lesson 1: Engage-Dynamic Earth.....	14-17
Lesson 2: Explore – Volcanoes.....	18-21
Lesson 3: Explain – Volcanoes .....	22-25
Lesson 4: Explore – Earthquakes and Tsunamis .....	26-29
Lesson 5: Explain – Earthquakes and Tsunamis .....	30-33
Lesson 6: Elaborate-Dynamic Earth.....	34-36
Lesson 7: Elaborate-Dynamic Earth.....	37-39
Lesson 8: Evaluate-Dynamic Earth .....	40-42
<b>APPENDICES</b>	
Appendix 1- Dynamic Earth equipment list.....	43
Appendix 2 - Dynamic Earth unit overview.....	44-45
Appendix 3.1 - Teacher approved web links .....	46
Appendix 3.2 - Teacher approved web links .....	47-78
Appendix 3.3 - Written test.....	49-51
Appendix 4 - Criteria marking sheet.....	52

# Backward Unit Planner

## Backward design unit planner

Unit title: Dynamic Earth Strand: \_\_\_\_\_ Stage: \_\_\_\_\_

Outcome: \_\_\_\_\_

PHASE	ACTIVITIES
EVALUATE	<p>What do you want the students to know? What representations will provide evidence that they understand the concepts?  <i>Science Understanding: Sudden geological changes or extreme weather conditions can affect Earth's surface. Science as Human Endeavour: science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena.</i></p> <p>What do you want the students to be able to do? How will they demonstrate this?  <i>students will be asked to complete written test to ascertain their understanding of the cause and effects of specified geological events, They will reflect on the relationship between their prior knowledge and current understanding.</i></p>
ELABORATE	<p>What student investigation/s or application of knowledge would extend their understanding? Representations?  <i>The poster and presentation making would apply and extend their conceptual understanding of dynamic Earth. This will challenge and extend students' Science Understanding and inquiry skills. At the end of Elaborate phase students will demonstrate their ability to: Construct and use a range of representations, including tables and graphs to represent and describe observations. Relationships in data using digital technologies as appropriate. Work collaboratively as part of both small groups and in whole class discussions. Communicate ideas, explanations and processes in variety of ways.</i></p>

# Backward design unit planner

<p>EXPLAIN</p>	<p>What are the current scientific explanations? How best can the students represent their understanding?                  1. How / why / where Volcanic form? The elements involved in an eruption, stages and types. What's their function. The difference between magma and lava, where they are most common.                  How / why / where plate tectonics form. The stages and types of Earthquakes and Tsunami's.                  2. How their measured, Earthquakes and Tsunami's in Australia. Where they are most common.                  The assessment of children's learning can help students to represent their understanding. What they know, understand and can demonstrate will be observed through their class participation through the lesson.</p>
<p>EXPLORE</p>	<p>What hands-on, shared experiences of the phenomenon are appropriate? Representations?                  1. Students conduct an experiment using Mentors and Diet soda to simulate a volcanic eruption.                  Representation: students will postulate the links between the experiment and geological events / participate in a group discussion.                  2. Students use Plasticine to mimic / model convergent plate boundaries.                  Representation: students will postulate links between real life and models.</p>
<p>ENGAGE</p>	<p>How can we engage students and elicit their prior knowledge? Representations?                  Ask students questions: What do we know about Earth? How big and what type of shape is the Earth?                  What would we discover if we dug a hole that went to the exact centre of the Earth?                  What if we kept digging?                  Watching videos on dramatic geological events.                  Representation: teacher led <del>large</del> small group discussion to check their prior knowledge.</p>

## Unit at a glance Dynamic Earth

Phase	Lesson	At a glance
<b>ENGAGE</b>	<b>1</b> Dynamic Earth	Engage student's interest and, at the same time, discover their prior knowledge on how sudden geological changes or extreme weather conditions can affect Earth's surface. Give student's opportunity to pose questions that will aid in their investigation.
<b>EXPLORE</b>	<b>2</b> Volcanoes	Students use hands on activities to explore the causes and effects of volcanoes.
<b>EXPLAIN</b>	<b>3</b> Volcanoes	Students use their findings to articulate their understanding of the causes and effects of volcanoes. They are provided with scientific evidence that explains the theory behind their observations.
<b>EXPLORE</b>	<b>4</b> Earthquakes and Tsunamis	Students use hands on activities to explore the causes and effects of Earthquakes. They are given opportunities to discover the links between Earthquakes and tsunamis.
<b>EXPLAIN</b>	<b>5</b> Earthquakes and Tsunamis	Students use their findings to articulate their understanding of the causes and effects of Earthquakes. They are provided with scientific evidence that explains the theory behind their observations.
<b>ELABORATE</b>	<b>6</b>	Students plan and construct a poster or presentation that will apply and extend their conceptual understanding of dynamic Earth. This lesson is designed to challenge and extend student's Science understanding and inquiry skills.
<b>ELABORATE</b>	<b>7</b>	Students present their poster or presentation that applies and extends their conceptual understanding of dynamic Earth. This lesson is designed to challenge and extend students' group work skill, Science understanding and inquiry skills.
<b>EVALUATE</b>	<b>8</b> What have we discovered?	Student's can demonstrate knowledge of how sudden geological changes or extreme weather conditions can affect Earth's surface. They achieve this in the form of a written test and a reflective summary.

## Alignment with the Australian Curriculum: Science

The *Dynamic Earth* unit combines and integrates the three strands of the Australian Curriculum: Science. This unit is designed for a Year 6 class and includes many of the sub-strands for this year level as outlined in the attached table.

Strand	Sub-strand	Code	Year 6 content descriptions	Lessons
Science Understanding (SU)	Earth and space sciences	ACSU096	Sudden geological changes or extreme weather conditions can affect Earth's surface	1-8
Science as a Human Endeavour (SHU)	Nature and development of science	ACSHE098	Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena	2-7
	Use and influence of science	ACSHE100	Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives	6-7
Science Inquiry Skills (SIS)	Questioning and predicting	AC SIS232	With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be	2-7
	Planning and conducting	AC SIS105	Use equipment and materials safely, identifying potential risks	2, 4
	Processing and analysing data and information	AC SIS221	Compare data with predictions and use as evidence in developing explanations	2-7
	Evaluating	AC SIS108	Suggest improvements to the methods used to investigate a question or solve a problem	8
	Communicating	AC SIS110	Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts	1-8

## Alignment with Australian Curriculum: English and Maths

Strand	Sub-strand	Code	Year 6 content descriptions	Lesson
English - Language	Expressing and developing ideas	ACELA1524	Identify and explain how analytical images like figures, tables, diagrams, maps and graphs contribute to our understanding of verbal information in factual and persuasive texts	3, 5
		ACELA1526	Understand how to use banks of known words, word origins, base words, suffixes and prefixes, morphemes, spelling patterns and generalisations to learn and spell new words, for example technical words and words adopted from other languages	1-8
English- Literacy	Interacting with others	ACELY1709	Participate in and contribute to discussions, clarifying and interrogating ideas, developing and supporting arguments, sharing and evaluating information, experiences and opinions	1-8
		ACELY1816	Use interaction skills, varying conventions of spoken interactions such as voice volume, tone, pitch and pace, according to group size, formality of interaction and needs and expertise of the audience	1-5
	Interpreting, analysing, evaluating	ACELY1711	Analyse how text structures and language features work together to meet the purpose of a text	3, 5
		ACELY1712	Select, navigate and read texts for a range of purposes, applying appropriate text processing strategies and interpreting structural features, for example table of contents, glossary, chapters, headings and subheadings	3, 5, 6, 7
		ACELY1713	Use comprehension strategies to interpret and analyse information and ideas. comparing content from a variety of textual sources including media and digital texts	1, 3, 5-8
	Creating texts	ACELY1714	Plan, draft and publish imaginative, informative and persuasive texts, choosing and experimenting with text structures, language features, images and digital resources appropriate to purpose and audience	3-8
	Mathematics - Statistics and Probability	Data representation and interpretation	ACMSP148	Interpret secondary data presented in digital media and elsewhere

## Alignment with Australian Curriculum General Capabilities

General capabilities	Australian Curriculum description	Unit Examples
<b>Literacy</b>	Literacy genres in science cannot be divorced from the gradual increase in scientific knowledge. The key is to develop a good series of literacy activities that align and support scientific principles.	In this unit the literacy focuses are: <ul style="list-style-type: none"> <li>• Science journals</li> <li>• Oral presentations (of ideas, group and whole class discussions).</li> <li>• TWLH charts</li> <li>• Factual recounts</li> <li>• Cutaway diagrams</li> <li>• Factual texts</li> </ul>
<b>Numeracy</b>	Numeracy is fundamental to science. The representation of data, the gathering of data in an organised way and drawing inference from data all have strong numeracy foundations.	Students: <ul style="list-style-type: none"> <li>• interpret data in graphs diagrams and other digital media.</li> <li>• Make assumptions from numerical data and factual texts.</li> </ul>
<b>Information and communication technology (ICT) competence</b>	New ICT availability has enormous potential to leverage the literacy and numeracy elements as well as numerous opportunities for modelling and graphic representation of principles and theories.	Students will have the opportunity to: <ul style="list-style-type: none"> <li>• View, record and analyse information through the use of interactive resource technology.</li> <li>• Use ICT for assessment.</li> </ul>
<b>Critical and creative thinking</b>	Open ended investigations and the scientific method that involves the formation of hypotheses and their testing provides potential for the full range of learning styles and the opportunity for students to create new thinking and work in a wide range of creative ways.	Students: <ul style="list-style-type: none"> <li>• Use critical and creative thinking to design questions on a TWLH chart and find answers through investigations</li> <li>• Analyse and evaluate multiple sources of information to answer designated questions</li> <li>• Draw inferences based on unit content about the cause and effects of plate tectonics.</li> </ul>



<b>General capabilities</b>	<b>Australian Curriculum description</b>	<b>Unit Examples</b>
<b>Personal and social competence</b>	Many scientific investigations involve group work that allows for the skill of all to be co-ordinated as well as to develop a wide range of social skills necessary to fully capitalize on the groups perspectives and skills.	Students: <ul style="list-style-type: none"> <li>• Participate in collaborative group dynamics.</li> <li>• Adhere to safety guide lines to successfully complete investigations</li> <li>• Actively participate in discussions</li> </ul>
<b>Intercultural understanding</b>	The spiritual elements of various cultures attempts to explain the Earth sciences has great potential for conflict and misunderstanding. The reliance on scientific method and the sense of thinking in two worlds allows the teacher to navigate this difficult area and hopefully allow for far greater cross cultural understanding.	Students are exposed to different cultural explanations than Earth sciences attempt to explain.

## **Cross curriculum Priorities**

This unit addresses two cross curriculum priorities identified by the Australian Curriculum:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia

### **Aboriginal and Torres Strait Islander histories and cultures**

The unit of work uses the scientific method. This is often confused as very much a western way of thinking. Cause and effect and the linear way of thinking is often not as powerful as the Aboriginal way which is far more holistic and deals more easily with multi variant situations. When the combination of many factors is the cause of an event Aboriginal ways of thinking can in fact be far more useful. In earth sciences and the models that explain the observed outcomes indigenous perspectives can be very useful in modelling and of course easier to understand for indigenous students.

Aboriginal people can have a deeply spiritual way of explaining earth formations. The Jabaki dreamtime stories of the Cairns area explain the mountain formations in terms of giant animals that have come to rest after great events of the dreamtime. Just like Christian contradictions these differences can be easily explained as living in two worlds -one a spiritual and the other a modern world of science. When embedding perspectives the key is to consult and involve available Elders in course content.

### **Asia and Australia's engagement with Asia**

These units have a special connection with Asia, that being the plate boundaries to our north and the three recent catastrophes of the Boxing Day Tsunami, the Japanese Tsunami and recent earthquake activity in China. Potentially students in our classes could have been directly affected by these events so great care should be taken.

Beyond this is the issue of a huge population that live to our north, and related issues like refugee events and the general but pronounced potential for grave social and economic events associated with plate movements Earthquakes and Tsunamis. This is an area of study that needs close care.

## **Teacher background information**

To be taken from:

### ***Primary Connections***

The link is a science background resource from Primary Connections regarding Earthquakes and has very important factual information as well as helpful images and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/earthquake/earthquake.htm>

### ***Primary Connections***

The link is a science background resource from Primary Connections regarding volcanoes and has very important factual information as well as helpful images, animated flash movie about hot spots and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/volcanoes/volcanoes.htm>

### ***Primary Connections***

The link is a science background resource from Primary Connections regarding tsunamis and has very important factual information as well as helpful images and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/tsunami/tsunami.htm>

### ***National Geographic***

This link has important information about Plate Tectonics specifically the different classifications of tectonic shift (Convergent Boundaries, Divergent Boundaries, and Transform Boundaries).

<http://science.nationalgeographic.com.au/science/earth/the-dynamic-earth/plate-tectonics-article/>

### ***Primary Connections***

This link contains some general information about the structure of the Earth with some informative diagrams. None of the information is Australia specific.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/strutearth/strutearth.htm>

## Key Misconceptions regarding plate tectonics volcanoes earthquakes and tsunamis

**Misconception** - The earth is solid at the crust but the inner layers are all molten

**Fact** - The crust is mostly solid, most of the mantle above 90% is solid with small pocket of molten rock, the outer core is molten but the inner core is solid.

**Misconception** – The age of the earth.

**Fact** - While the age of the earth cannot be determined exactly the accepted age is around 4.5 billion years. This area is subject to religious sensitivities and needs to be dealt with carefully as all earth science hinges on a very old earth.

**Misconception** - mountains form very quickly.

**Fact** – Quickly is a very subjective term the current shape of the earth crust took billions of years to form.

**Misconception** – Plate tectonics is an established fact.

**Fact** – Like most of science the movement of continents is subject to a range of theories regarding causality. 3 well supported theories exist. The convection cell model, the slab push/pull model and the hot spot model.

**Misconception**- A wide range of guesses relate to the relative thickness of the earth's Crust

**Fact** - The earth's crust is 8 – 32 klms thick which represents a very small fraction of the radius. The crust differences explain the subduction of ocean plates under continental plates.

**Misconception** - The Continents do not move

**Fact** – All the continents were once joined in a super continent Pangaea and the current shape of the continents can be traced back to the original whole which was broken apart.

**Misconception** – Earthquakes has nothing to do with plate movement.

**Fact** - the complete opposite is correct with crust thickness and quake depth providing critical evidence for plate movement.

**Misconception** -The Richter scale is linear.

**Fact** - Earthquake strength is a logarithmic scale a 7 is ten times a 6 and a 100 times as powerful as a 5. The scale largely relates to potential destruction.

**Misconception** - Earthquakes are completely unpredictable.

**Fact** - prediction is a matter of location and probabilities. Detailed stress measurements and volcano activity are good guides.

**Misconception** - Tsunamis are unpredictable.

**Fact** - Massive movement of the earth's crust may cause a tsunami. After some terrible Tsunami's a lot has been invested in early warning science allowing people to get to high ground. Property loss cannot be avoided but lives can be saved with early warning.

**Misconception** - Tsunamis are just like big tides.

**Fact** - Tsunamis are not related to tide movement

## **Lesson 1: Engage-Dynamic Earth**

**Date:** TBC

**Time:** 60minutes

**Year:** 6

**Australian Curriculum: Science**

### **Lesson at a glance**

This lesson involves whole class discussion which is intended to motivate students to further explore the topic.

### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

Students achieve this by:

- describing how understanding of the causes and effects of major natural events has changed as new evidence has become available

### **Science Inquiry Skills:**

With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be ([AC SIS232](#))

Students achieve this by:

- refining questions to enable scientific investigation
- asking questions to understand the scope or nature of a problem
- applying experience from previous investigations to predict the outcomes of investigations in new contexts

### **LEARNING OBJECTIVES:**

**At the end of this lesson students will have the opportunity to demonstrate their ability to:**

1. Share points of view and respond to others respectfully and effectively
2. Work collaboratively as part of both small groups and in whole class discussions
3. Collaboratively design research questions and procedures

## **RESOURCES:**

TWLH chart

Fire, Lava & Smoke: Stunning video of erupting Russian volcano 0:54  
<http://www.youtube.com/watch?v=bZ99SnjR46Q>

Earthquake Destruction 0:48  
[http://www.youtube.com/watch?v=4Y-62Ti5\\_6s](http://www.youtube.com/watch?v=4Y-62Ti5_6s)

Earthquake Destruction 0:48  
[http://www.youtube.com/watch?v=4Y-62Ti5\\_6s](http://www.youtube.com/watch?v=4Y-62Ti5_6s)

Tsunami Climbing: Incredible video of ship heading into wave in Japan 1:24  
<http://www.youtube.com/watch?v=OdhfV-8dbCE>

Amazing power of Japanese Tsunami caught on video 1 5:45  
[http://www.youtube.com/watch?v=9X\\_TxoN2WXo](http://www.youtube.com/watch?v=9X_TxoN2WXo)

## **STUDENTS' PRIOR KNOWLEDGE:**

This lesson is designed to ascertain student's prior knowledge. By year 6 students have worked in groups to research science topics with a view to creating new knowledge. They understand the procedure for effectively sharing and responding to different points of view. They have learned that: Earth's surface changes over time as a result of natural processes and human activity ([ACSSU075](#))

## **LESSON PROCEDURE:** (20 minutes)

### **Motivation and Lesson Introduction:**

Ask class to stand up and describe what is supporting them. Responses should be that it is the floor or the building. Move class outside and repeat the question.

Desired response is that we are standing on the surface of the Earth.

### ***Focus questions.***

- What do we know about the Earth?
- How big and what shape is the Earth?

- What would we discover if we dug a hole that went to the exact centre of the Earth?
- What if we kept digging?

Student responses are to be recorded.

***Focus questions.***

- Is the Earth a stable ball of rock?
- What changes have we observed personally?
- Have we seen events in the media that show how the Earth is constantly changing?
- What are the most common and dramatic causes of this change?

Student responses are to be recorded.

**Lesson content:** (30 minutes)

Move class back into classroom and watch videos on dramatic geological events. After each video ask students to comment on what is happening and what they think are the causes. Responses (and previous responses) are to be recorded on a TWLH chart. Discuss any conflicting opinions and ask how we can discover which is closest to the truth. Teacher to facilitate whole class discussion on what direction our investigation should take and record on KWL chart.

**Lesson conclusion:** (10 minutes)

Teacher led whole class discussion to review lesson content.

***Focus questions.***

- What do we already know?
- What do we want to know?
- How will we discover this?

Explain that the next lesson will involve groups using hands on activities to explore geological events such as volcanoes, earthquakes and tsunamis.

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**



This lesson is intended to engage the students and to discover and activate their prior knowledge. As such there is no formal assessment; informal assessment will be teacher's observations of student's level of prior knowledge and participation.

### **LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

This lesson comprises whole class discussion It is designed to be accessible to all students. Students who do not actively contribute are to be encouraged and scaffolded with open ended questions. Teacher to use discretion when catering for students with additional needs.

### **EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

This lesson is the first of eight in a unit on Earth and space sciences. Students will be engaging in whole class discussions and investigations and will finish at the same time.

### **EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. Express their opinions with conviction and respond to peers?
2. Contribute to group activities and as part of a whole class discussion?
3. Work effectively in a team to create meaningful learning criteria?

## **Lesson 2: Explore – Volcanoes**

**Date:** TBC

**Time:** 60 min

**Year:** 6

**Australian Curriculum: Science**

### **Lesson at a glance**

This lesson will feature students engaging in a controlled experiment that will guide student discussion related to the topic of volcanoes.

### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

### **Science Inquiry Skills:**

With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be ([AC SIS232](#))

Students achieve this by:

- refining questions to enable scientific investigation
- asking questions to understand the scope or nature of a problem
- applying experience from previous investigations to predict the outcomes of investigations in new contexts

### **LEARNING OBJECTIVES:**

By the end of this lesson students will have had the opportunity to:

1. Conduct an experiment using Mentos and Diet soda to simulate a volcanic eruption (students will postulate the links between the experiment and geological events)

2. Demonstrate their current understanding of volcanoes (how they form, what their function may be, the difference between magma and lava, where they are most common)
3. Participate in a group discussion

## RESOURCES

1. 1 Roll of mentos mint candies
2. 2-litre of bottled diet soda (note that diet soda erupts higher than regular soda)
3. A narrow test-tube that's about the circumference of the mentos or a funnel wide enough for the mentos to fit into. You may also use a narrow piece of paper to fold into a tube.
4. Index card
5. Cordless drill and 1/8 drill bit
6. Student's science journal.
7. TWLH chart

## STUDENTS' PRIOR KNOWLEDGE

This lesson is designed to explore student's prior knowledge, students must also have a broad understanding to be able to build upon what they already know. By year 6 students have worked in groups to research science topics with a view to creating new knowledge. They understand the procedure for effectively sharing and responding to different points of view. They have learned that: Earth's surface changes over time as a result of natural processes and human activity ([ACSSU075](#))

## LESSON PROCEDURE

The purpose of this lesson is Explore: Students carry out hands-on activities in which they explore the concept or skill. They grapple with the problem or phenomenon and describe it in their own words. This phase allows students to acquire a common set of experiences that they can use to help each other make sense of the new concept or skill.

**Lesson Introduction:** (10 minutes)

Teacher provides an overview of the lesson.

- Quick check to confirm assumptions regarding prior knowledge. Teacher directed question and answer
- Conceptualize the lesson and where it sits in the series of work
- What will be learned this lesson – quick example of competency to be gained

Today's focus is on volcanoes

Teacher is to take class outside ensuring that all students adhere to schools sun safe policies, and have students congregate around a large flat grassed area.

Teacher to layout the 2 litre diet soda and materials for the experiment, and ask students to predict what will happen.

**Lesson content:** (30 minutes)

- Confirm behaviour expectations and class rules
- Confirm all student movement and class groupings
- Check for understanding

**Step-By-Step Procedure**

1. Place 1 roll of mentos candies inside the test-tube or funnel so that they're stacked one on top of the other in a single column. If you don't have a suitable test-tube, roll a piece of paper into a narrow tube just wide enough to fit the mentos into.
2. Place the index card over the mouth of the test-tube or paper tube on the top end. Invert the test tube (flip it over) so that the index card stops the candies from falling out.
3. Open the two litre bottle of soda by removing the cap, drill a hole in the centre of the cap and shake the bottle a little.
4. The eruption will happen very quickly, so make sure to be prepared. Place the rolled candies from the tube over the bottle opening, index card down. Remove the index card so that the candies will fall into the bottle in one smooth motion.
5. Very quickly replace the lid.
6. Stand back and watch the volcano erupt, shooting jets of soda several feet into the air.

Teacher to break the class into groups of 3 and have students conduct the Final Word procedure to attempt to explain what is happening and whether some of the elements of the experiment could be likened to volcanoes. Student responses are to be recorded in their science journal.

**Lesson conclusion:** (10 minutes)

Teacher reinforces what they were learning in this lesson.

What did we learn about today?

- Build upon the prior knowledge

Student responses to be presented to whole class.

Has the lesson refined student questions? Review and update TWLH chart

Gets students to reiterate and reflect on what they learnt today and write it in their science journal. Did they enjoy it? What did they like, their understanding of the concepts? How do they think they went?

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

Assessment of children's learning – what they now know, understand & can demonstrate- will be observed through their class participation through the lesson.

They will be assessed on their knowledge of the concept, the workings, and their understanding. Observation of science journal entries will be used to gauge student understanding.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should use discretion when needing to accommodate individual learning needs for a particular student.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

Students are to attempt to explain why the mentos and diet soda reacted in the manner it did.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. communicate the links between the experiment and geological events?
2. effectively demonstrate their current understanding of volcanoes?
3. actively participate in the group discussion?

## **Lesson 3: Explain – Volcanoes**

**Date:** TBC

**Time:** 60 minutes

**Year:** 6

### **Australian Curriculum: Science**

#### **Lesson at a glance**

This lesson involves whole class and group discussions examining pictures/diagrams and factual texts. It offers students a chance to respond to pictures/diagrams about volcanoes; read and discuss a factual text about volcanoes (how/why/where they form, elements involved in an eruption, stages and types) and discuss how volcanoes change the shape of the Earth's crust.

#### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

#### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

Students achieve this by:

- describing how understanding of the causes and effects of major natural events has changed as new evidence has become available

#### **Science Inquiry Skills:**

With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be ([AC SIS232](#))

Students achieve this by:

- refining questions to enable scientific investigation
- asking questions to understand the scope or nature of a problem
- applying experience from previous investigations to predict the outcomes of investigations in new contexts

## **LEARNING OBJECTIVES:**

By the end of this lesson students will have had the opportunity to:

4. Compare their observations with factual data
5. Expand and demonstrate their current understanding of volcanoes (how/why/where they form, elements involved in an eruption, stages and types, what their function may be, the difference between magma and lava, where they are most common)
6. Participate in a group discussion

## **RESOURCES**

- Teacher approved web links (Appendix 3.1)
- Student's science journal with observations from previous Explore lesson.
- Online computer; 1 between groups of 3
- TWLH chart

## **STUDENTS' PRIOR KNOWLEDGE**

This lesson is designed to explore and expand student's prior knowledge, students must also have a broad understanding to be able to build upon what they already know. By year 6 students have worked in groups to research science topics with a view to creating new knowledge. They understand the procedure for effectively sharing and responding to different points of view. They have learned that: Earth's surface changes over time as a result of natural processes and human activity ([ACSSU075](#))

## **LESSON PROCEDURE**

The purpose of this lesson is Explain:

Only after students have explored the concept or skill does the teacher provide the concepts and terms used by the students to develop explanations for the phenomenon they have experienced. The significant aspect of this phase is that explanation follows experience.

### **Lesson Introduction:** (10 minutes)

Teacher provides an overview of the lesson.

- Quick check to confirm assumptions regarding prior knowledge. Teacher directed question and answer
- Conceptualize the lesson and where it sits in the series of work
- What will be learned this lesson – quick example of competency to be gained

Today's focus is on expanding our work with volcanoes

Teacher to outline to students that they will be finding out about volcanoes using approved websites and online fact sheets to expand their understanding.

First the class is to review their findings from the previous lesson (outlined in their science journals). The teacher should then model for the student where to find the approved links and what their work should look like.

Break class into groups of 3; students are to work in small groups to answer student created and teacher questions developed in the first *engage* lesson and refined in the *explore* lesson. (i.e. What are the characteristics of volcanoes? How can you tell if a volcano is active, dormant or extinct? What are volcanic eruptions and what are some of the common elements of eruptions? What are the types of volcanoes? Where do volcanoes form? Are there any Active, dormant or extinct volcanoes in Australia?)

**Lesson content:** (45 minutes)

- Confirm behaviour expectations and class rules
- Confirm all student movement and class groupings
- Check for understanding

Students should be given 30 minutes to complete this stage of the lesson with the teacher moving around assisting group individually.

Student responses to be recorded in their science journal.

Once the 30 minutes has expired the teacher is to lead a discussion on how students understanding has advanced

Has the information they have interacted with confirmed their conclusions from the experiment?



Has the new information changed any of their thinking about volcanoes? How has their thinking advanced?

**Lesson conclusion:** (5 minutes)

- Check again for understanding

Teacher reinforces what they were learning in this lesson.

What did we learn about today? Review and update TWLH chart

- Build upon the prior knowledge – see the series of learning

Student responses to be presented to whole class.

Gets students to reiterate and reflect on what they learnt today. Write it in their science journal. Did they enjoy it? What did they like? How do they think they went?

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

Assessment of children’s learning – what they now know, understand & can demonstrate, will be observed through their class participation through the lesson. They will be assessed on their knowledge of the concept, the workings, and their understanding. Observation of science journal entries will be used to gauge student understanding.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should use discretion when needing to accommodate individual learning needs for a particular student.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

Students are to attempt to explain why the mentos and diet soda reacted in the manner they did.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. effectively compare their observations with factual data?
2. fully engage in the lesson and expand and demonstrate their understanding of volcanoes?
3. actively participate in a group discussion to further their understanding?

## **Lesson 4: Explore – Earthquakes and Tsunamis**

**Date:** TBC

**Time:** 60 minutes

**Year:** 6

**Australian Curriculum: Science**

### **Lesson at a glance**

This lesson will feature students engaging in two activities that will guide student discussion related to the cause and effect of plate tectonics with emphasis on Earthquakes (layered plasticine blocks) and Tsunamis (elevated uneven fish tank).

This will allow students to explore and describe the features of tectonic plate movement, work in teams to examine the features of tectonic plate movement, and investigate different forms of tectonic plate movement and their cause and effect.

### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

### **Science Inquiry Skills:**

With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be ([AC SIS232](#))

Students achieve this by:

- refining questions to enable scientific investigation
- asking questions to understand the scope or nature of a problem
- applying experience from previous investigations to predict the outcomes of investigations in new contexts

### **LEARNING OBJECTIVES:**

By the end of this lesson students will have had the opportunity to:

7. Use plasticine to mimic/model convergent plate boundaries (students will postulate links between real life and models)
8. Use an inclined fish tank to simulate the creation of tsunamis
9. Demonstrate their current understanding of plate tectonics Earthquakes and tsunamis (how they form, what their function may be, the difference between underwater Earthquakes and those that occur on land, where they are most common)
10. Participate in a group discussion

## RESOURCES

11. Plasticine of at least 3 different colours
12. Rolling pin and board
13. Plastic knife
14. Fish tank
15. Over head projector
16. Ruler
17. Student's science journal
18. Card board 20x20cm 1 for every group of 3
19. Red food dye
20. TWLH chart

## STUDENTS' PRIOR KNOWLEDGE

This lesson is designed to explore student's prior knowledge, students must also have a broad understanding to be able to build upon what they already know. By year 6 students have worked in groups to research science topics with a view to creating new knowledge. They understand the procedure for effectively sharing and responding to different points of view. They have learned that: Earth's surface changes over time as a result of natural processes and human activity ([ACSSU075](#))

## LESSON PROCEDURE

The purpose of this lesson is Explore:

Students carry out hands-on activities in which they can explore the concept or skill. They grapple with the problem or phenomenon and describe it in their own words. This phase allows students to acquire a common set of experiences that they can use to help each other make sense of the new concept or skill.

### Before lesson:

Use a rolling pin and board to flatten out the plasticine and layer each sheet to simulate the sedimentary rock of the Earth's crust. The "crust" should then be cut using the plastic knife into blocks 10x10cm each group of 3 will need 2 blocks. Setup fish tank on OHP elevating the edge facing the class approximately 2-3cm and fill the tank so that approximately 5cm of the base of the tank is uncovered by water. Teacher should practice placing the ruler into the water and moving the lower edge of the ruler while attempting to keep the at the water's surface still.

### Lesson Introduction: (10 minutes)

Teacher provides an overview of the lesson.

- Quick check to confirm assumptions regarding prior knowledge. Teacher directed question and answer

- Conceptualize the lesson and where it sits in the series of work
- What will be learned this lesson – quick example of competency to be gained

Today's focus is on plate tectonics, tsunamis and Earthquakes

Teacher to ascertain students' current level of understanding regarding Earthquakes and tsunamis; and write student responses on the whiteboard.

Each group of 3 students is to gather their materials (20x20 card board, 10x10 plasticine blocks prepared before the lesson x2)

**Lesson content:** (40 minutes)

- Confirm behaviour expectations and class rules
- Confirm all student movement and class groupings
- Check for understanding

Students are to use the materials provided to demonstrate and explore what they know about the movement of tectonic plates, and record their observations in their science journals.

Teacher to move about the classroom and prompt students with questions they can answer with their observations, and model different types of plate movement (Convergent, Divergent, and Transform Boundaries)

***Focus questions***

Why do you think the plasticine is different colours? What do you think this signifies?

What do you observe when the 'tectonic plates' are pushed together? What would you call this?

What do you observe when the 'tectonic plates' slide and grind against each other? What would you call this?

What do you observe when the 'tectonic plates' move away from each other? What would you call this? What do you think happens when this occurs?

Student responses to be recorded in their science journal.

Teacher to give students 20 minutes to complete this activity

Draw students attention to the tsunami simulator (fish tank and OHP setup before the lesson), and add red food dye to the water to make the water easier to see on the OHP.

Teacher should then simulate the tsunamis and have students make observations to be recorded in their science journals.

Bring students attention to the technique being used to simulate the tsunamis, have students provide explanations as to why this method is used.

**Lesson conclusion:** (10 minutes)

- Check again for understanding

Teacher reinforces what they were learning in this lesson.

What did we learn about today?

- Build upon the prior knowledge – see the series of learning

Student responses to be presented to whole class.

Has the lesson refined student questions? Review and update TWLH chart

Gets students to reiterate and reflect on what they learnt today. Write it in their science journal. Did they enjoy it? What did they like. How do they think they went?

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

Assessment of children's learning – what they now know, understand & can demonstrate, will be observed through their class participation through the lesson. They will be assessed on their knowledge of the concept, the workings, and their understanding. Observation of science journal entries and participation in group discussions will be used to gauge student understanding.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should use discretion when needing to accommodate individual learning needs for a particular student.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

Students are to attempt to explain how tsunamis form using the simulator at the front of class as inspiration.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. Use the plasticine to mimic/model convergent plate boundaries?
2. Effectively describe how tsunamis occur using the inclined fish tank?
3. Effectively demonstrate their current understanding of plate tectonics with respect to Earthquakes and tsunamis using the materials provided?
4. Effectively participate in group discussion?

## **Lesson 5: Explain – Earthquakes and Tsunamis**

**Date:** TBC

**Time:** 90 minutes

**Year:** 6

**Australian Curriculum: Science**

### **Lesson at a glance**

This lesson involves whole class and group discussion, examining pictures/diagrams and factual texts. It offers students a chance to

- respond to pictures/diagrams about plate tectonics and their effects.
- Earthquakes and tsunamis; read and discuss factual texts (how/why/where they form, stages and types, how they are measured)
- Earthquakes and tsunamis in Australia; discuss how Earthquakes and tsunamis are created by movement of the Earth's crust.

### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

Students achieve this by:

- describing how understanding of the causes and effects of major natural events has changed as new evidence has become available

### **Science Inquiry Skills:**

With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be ([AC SIS232](#))

Students achieve this by:

- asking questions to understand the scope or nature of a problem

- refining questions to enable scientific investigation
- applying experience from previous investigations to predict the outcomes of investigations in new contexts

## **LEARNING OBJECTIVES:**

By the end of this lesson students will have had the opportunity to:

21. compare their observations with factual data
22. expand and demonstrate their current understanding of plate tectonics and their effects on Earthquakes and tsunamis (how/why/where they form, stages and types, how they are measured)
23. Participate in a group discussion

## **RESOURCES**

- Teacher approved web links (Appendix 3.2)
- Student's science journal with observations from previous *Explore* lesson.
- Online computer 1 between groups of 3
- TWLH chart

## **STUDENTS' PRIOR KNOWLEDGE**

This lesson is designed to explore and expand student's prior knowledge, students must also have a broad understanding to be able to build upon what they already know. By year 6 students have worked in groups to research science topics with a view to creating new knowledge. They understand the procedure for effectively sharing and responding to different points of view. They have learned that: Earth's surface changes over time as a result of natural processes and human activity ([ACSSU075](#))

## **LESSON PROCEDURE**

The purpose of this lesson is Explain:

Only after students have explored the concept or skill does the teacher provide the concepts and terms used by the students to develop explanations for the phenomenon they have experienced. The significant aspect of this phase is that explanation follows experience.

## **Lesson Introduction:** (15 minutes)

Teacher provides an overview of the lesson.

- Quick check to confirm assumptions regarding prior knowledge. Teacher directed question and answer
- Conceptualize the lesson where it sits in the series of work
- What will be learned this lesson – quick example of competency to be gained

Today's focus is on expanding our work with plate tectonics and their effects on Earthquakes and tsunamis.

Teacher to outline to students that they will be finding out about plate tectonics and their effects on Earthquakes and tsunamis using approved websites and online fact sheets to expand their understanding.

First the class is to review their findings from the previous lesson (outlined in their science journals). The teacher should then model where to find the approved links and what their work should look like.

Break class into groups of 3; students are to work in small groups to answer student created and teacher questions developed in the *Engage* lesson and refined in the *Explore* lesson. (i.e. What are some of the effects of plate tectonics? Where are Earthquakes and tsunamis most common? Describe some of the elements of Earthquakes and tsunamis? How are Earthquakes and tsunamis measured? When was the last Earthquake and/or tsunami recorded in Australia?)

## **Lesson content:** (60 minutes)

- Confirm behaviour expectations and class rules
- Confirm all student movement and class groupings
- Check for understanding

Students should be given 45 minutes to complete this stage of the lesson with the teacher moving around assisting groups.

Student responses to be recorded in their science journal.

Once the 45 minutes has expired the teacher is to lead a discussion on how student's understanding has advanced

Has the information they have interacted with confirmed their conclusions from the experiment?

Has the new information changed any of their thinking about plate tectonics and their effects on Earthquakes and tsunamis? How has their thinking advanced?



**Lesson conclusion:** (15 minutes)

- Check again for understanding

Teacher reinforces what they were learning in this lesson.

What did we learn about today? Review and update TWLH chart

- Build upon the prior knowledge – see the series of learning

Student responses to be presented to whole class.

Gets students to reiterate and reflect on what they learnt today. Write it in their science journal. Did they enjoy it? What did they like. How do they think they went?

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

Assessment of children's learning – what they now know, understand & can demonstrate, will be observed through their class participation through the lesson. They will be assessed on their knowledge of the concept, the workings, and their understanding. Observation of science journal entries will be used to gauge student understanding.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should use discretion when needing to accommodate individual learning needs for a particular student.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

Attempt to create a seismograph to measure Earthquake tremors with materials around the room.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. effectively compare their observations with factual data?
2. fully engage in the lesson and expand and demonstrate their understanding of plate tectonics and their links to Earthquakes and tsunamis?
3. actively participate in a group discussion to further their understanding?

## **Lesson 6: Elaborate-Dynamic Earth**

**Date:** TBC

**Time:** 60minutes                      **Year:** 6

### **Australian Curriculum: Science**

#### **Lesson at a glance**

This lesson will ask students to plan and construct a poster or presentation that will apply and extend their conceptual understanding of dynamic Earth. This lesson is designed to challenge and extend student's Science understanding and inquiry skills.

#### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

#### **Science as a Human Endeavour:**

Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives (ACSHE100)

Students achieve this by:

Researching the scientific work involved in global disaster alerts and communication, such as cyclone, earthquake and tsunami alerts.

#### **Science Inquiry Skills:**

With guidance, plan appropriate **investigation** methods to answer questions or solve problems (AC SIS103)

Students achieve this by:

- Following a procedure to design an experimental or field investigation
- Discussing methods chosen with other students, and refining methods accordingly
- Considering which investigation methods are most suited to answer a particular question or solve a problem

## **LEARNING OBJECTIVES:**

**At the end of this lesson students will have the opportunity to demonstrate their ability to:**

1. Construct and use a range of representations, including tables and graphs to represent and describe observations, patterns or relationships in data using digital technologies as appropriate.
2. Work collaboratively as part of both small groups and in whole class discussions
3. Communicate ideas, explanations and processes in a variety of ways.

## **RESOURCES:**

- Student science journal
- TWLH chart
- Coloured cardboard and markers
- Computers
- A large map of the world

## **STUDENTS' PRIOR KNOWLEDGE:**

Students are undertaking an eight lesson unit on the causes and effects of sudden geologic changes to Earth's surface. They are used to working in groups and reflecting on new and prior learning.

## **LESSON PROCEDURE**

### **Motivation and Lesson Introduction:** (15 minutes)

1. Teacher reviews the previous lesson including the students science journal, glossary and KWL chart.
2. Teacher shows the map of the world to students and invites students to use coloured makers to indicate where they think natural disasters, such as earthquakes might occur, particularly in areas around Australia and neighboring countries, which includes New Zealand, Fiji, Japan and China. Teacher should encourage students to provide reasons for their choices.
3. Teacher asks students to predict what types of natural disasters might happen in these countries. Teacher discusses with students whether all of these natural disasters might cause the same damage. Teacher needs to encourage students to support their predictions with reasons.

### **Lesson content:** (30minutes)

4. Teacher will put whole class into group of three and ask them to prepare a poster or presentation related to natural disasters that they have discussed in this lesson. The poster or presentation will be shown and presented to the whole class in lesson 7.
5. Teacher needs to provide more detail about this poster and presentation if needed. The natural disasters can be chosen from earthquake, tsunamis, and volcanoes. Students are to demonstrate scientific knowledge they have learned from the previous lesson in their posters and presentations.
6. Teacher will provide extra time for students to work on their projects. Computers, ipad and various books can be used as their researching tools.
7. Teacher should answer students' questions during the lesson

**Lesson conclusion:** (15 minutes)

8. Teacher will ask each group to share their chosen topic and identify which way they are going to present their work - poster or presentation.
9. Teacher needs to remind groups that the poster and presentation will be started in lesson 7.
10. At the end of lesson teacher asks students to update the TWLH chart and students' individual glossaries in their science journal.

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

This poster and presentation can be used to formally assess students' understanding of the dynamic Earth and the scientific knowledge from previous lessons. Students are also assessed on their ability to compare and discuss data about the occurrence of natural disasters in Australia and neighboring countries, which will provide a strong connection with Asian countries.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should be prepared to provide extra help for students with additional needs such as ESL learners and those with learning difficulties.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

For groups who finish their projects early teacher can ask them to practice their presentation or organise their ideas for their poster.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. connect their new learning with previous knowledge?
2. effectively communicate with their peers during group work?
3. use new knowledge effectively in their poster or presentation?

## **Lesson 7: Elaborate-Dynamic Earth**

**Date:** TBC

**Time:** 60minutes

**Year:** 6

### **Australian Curriculum: Science**

#### **Lesson at a glance**

This lesson will ask students to present their poster or presentation that will apply and extend their conceptual understanding of dynamic Earth. This lesson is designed to challenge and extend students' group work skill, Science understanding and inquiry skills.

#### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface ([ACSSU096](#))

#### **Science as a Human Endeavour:**

Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives (ACSHE100)

Students achieve this by:

Researching the scientific work involved in global disaster alerts and communication, such as cyclone, earthquake and tsunami alerts.

#### **Science Inquiry Skills:**

With guidance, plan appropriate investigation methods to answer questions or solve problems (ACSIS103)

Students achieve this by:

- Following a procedure to design an experimental or field investigation
- Discussing methods chosen with other students, and refining methods accordingly
- Considering which investigation methods are most suited to answer a particular question or solve a problem

#### **LEARNING OBJECTIVES:**

**At the end of this lesson students will have the opportunity to demonstrate their ability to:**

1. Construct and use a range of representations, including tables and graphs to represent and describe observations, patterns or relationships in data using digital technologies as appropriate.
2. Work collaboratively as part of both small groups and in whole class discussions
3. Communicate ideas, explanations and processes in a variety of ways.

### **RESOURCES:**

- Student science journal
- KWL chart
- Coloured cardboard and markers
- Computers
- Smart board
- White board
- A large map of the world

### **STUDENTS' PRIOR KNOWLEDGE:**

Students are undertaking an eight lesson unit on the causes and effects of sudden geologic changes to Earth's surface. They are used to working in groups and reflecting on new and prior learning.

### **LESSON PROCEDURE**

#### **Motivation and Lesson Introduction:** (15 minutes)

11. Teacher reviews the previous lesson including the students science journal, glossary and TWLH chart.
12. Teacher provides the overview of this lesson and separates whole class into two big groups. One group is going to share their posters, and another group will present their presentation.

#### **Lesson content:** (30minutes)

13. Teacher will ask first group to start their presentation and remind other groups to pay attention.
14. After each presentation discuss and ask students to share their responses.
15. Students to present their posters.
16. After each presentation discuss and ask students to share their responses.

**Lesson conclusion:** (15 minutes)

17. Teacher to facilitate whole class discussion and encourage every student to share their understanding of dynamic Earth and natural disasters.
18. At the end of lesson teacher asks students to update the TWLH chart and students' individual glossaries in their science journal.

**ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

This poster and presentation can be used to formally assess students' understanding of the dynamic Earth and the scientific knowledge from previous lessons. Students are also assessed on their ability to compare and discuss data about the occurrence of natural disasters in Australia and neighboring countries, which will provide a strong connection with Asian countries.

**LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

Teacher should be prepared to provide extra help for students with additional needs such as ESL learners and those with learning difficulties.

**EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

All students to finish at the same time.

**EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. connect their new learning with previous knowledge?
2. effectively communicate with their peers during group work?
3. present their work confidently and effectively?

## **Lesson 8: Evaluate-Dynamic Earth**

**Date:** TBC

**Time:** 60minutes

**Year:** 6

### **Australian Curriculum: Science**

#### **Lesson at a glance**

Students will complete a written test to ascertain their understanding of the cause and effects of specified geological events. They will reflect on the relationship between their prior knowledge and current understanding.

### **Australian Curriculum: Science**

#### **Science Understanding - Earth and space sciences**

Sudden geological changes or extreme weather conditions can affect Earth's surface  
([ACSSU096](#))

#### **Science as a Human Endeavour:**

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena ([ACSHE098](#))

Students achieve this by:

- describing how understanding of the causes and effects of major natural events has changed as new evidence has become available

### **Australian Curriculum: English**

Use [comprehension strategies](#) to interpret and analyse information and ideas, comparing content from a variety of textual sources including media and [digital texts](#)  
([ACELY1713](#))

#### **LEARNING OBJECTIVES:**

**At the end of this lesson students will have the opportunity to demonstrate their ability to:**

1. Demonstrate new learning
2. Reflect on new learning and extend this to new situations
3. Communicate understanding to a wider audience



## **RESOURCES:**

- Student science journal
- TWLH chart
- Written exam (Appendix 3.3)

## **STUDENTS' PRIOR KNOWLEDGE**

This is the eighth lesson of a unit on the cause and effect of sudden geologic changes to Earth's surface. Students are used to working in groups and reflecting on new and prior learning.

## **LESSON PROCEDURE**

### **Motivation and Lesson Introduction:** (15 minutes)

Teacher is to pull all the threads of this lesson together by recounting the unit content in sequence. Students are given the opportunity to share their new understanding with the class.

### **Lesson content:** (20 minutes)

Students are to complete written multiple choice exam to demonstrate their knowledge and understanding. (Appendix 3.3)

### **Lesson conclusion:** (25 minutes)

Students are to reflect on their new learning by writing in SOSE workbook. They will be required to demonstrate how misconceptions have been addressed and how their new knowledge can apply to this and other subjects.

## **ASSESSMENT/EVALUATION OF STUDENT LEARNING:**

This lesson is the final lesson in the unit. The assessment is summative and will test students knowledge and understanding as well as their ability to communicate however, teachers should still be assessing students verbal responses and questions for depth of understanding.

## **LESSON MODIFICATION TO ACCOMMODATE INDIVIDUAL STUDENTS:**

It is expected that some students will have difficulty completing these assessment tasks. These students should be encouraged to re-read their previous journal entries and the class TWLH chart.

## **EXTENDED ACTIVITIES FOR ADVANCED LEARNERS:**

Students who finish their reflection early will be asked to help struggling students, thereby giving them an opportunity to further articulate their understanding.

## **EVALUATION – LEARNING OBJECTIVES:**

Were students able to:

1. Demonstrate new learning by accurately completing written exam?
2. Reflect on their new learning while making links with prior knowledge?
3. Effectively communicate their understanding?

## Appendix 1- Dynamic Earth equipment list

EQUIPMENT ITEM	QUANTITIES	Lesson	1	2	3	4	5	6	7	8
<b>Equipment and Materials</b>										
2-litre of bottled diet soda	1 per class			•						
A narrow test-tube	1 per class			•						
Cardboard 20x20cm	1 per team					•				
Cardboard (coloured)	1 per team							•	•	
Computer/Internet access/ projector screen	1 per team		•		•		•	•	•	
Cordless drill and 1/8 drill bit	1 per class			•						
Fish tank	1 per class					•				
Index card	1 per class			•						
Map of the world (large)	1 per class							•	•	
Markers (colours - permanent)	1 per team							•	•	
Markers (non - permanent)	1 per class								•	
Over head projector	1 per class					•				
Plastic knife	1 per class					•				
Plasticine (at least 3 different colours)	1 per team					•				
Red food dye	1 per class					•				
Roll of mentos mint candies	1 per class			•						
Rolling pin and board	1 per class					•				
Ruler	1 per class					•				
Smart board	1 per class								•	
White board	1 per class								•	
<b>Resource sheets</b>										
Multiple choice test										•
Teacher approved web links Appendix L3-1	1 per team				•					
Teacher approved web links Appendix L5-1	1 per team						•			
<b>Teaching tools</b>										
Student's science journal	1 per student			•	•	•	•	•	•	•
TWLH chart	1 per class		•	•	•	•	•	•	•	•
<b>Multimedia</b>										
Resource Materials	Assorted per team		•		•		•	•	•	

## Appendix 2 - Dynamic Earth unit overview

		<b>SCIENCE OUTCOMES</b>	<b>LITERACY OUTCOMES</b>	<b>LESSON SUMMARY</b>	<b>ASSESSMENT OPPORTUNITIES</b>
	<b>Lesson</b>	Students will be able to demonstrate understanding as they:	Students are able to:	Students:	
<b>ENGAGE</b>	<b>1</b>	<ul style="list-style-type: none"> <li>describe sudden geological events they observe on videos</li> <li>begin to construct a group investigation</li> </ul>	<ul style="list-style-type: none"> <li>contribute to group activities and whole class discussions</li> <li>contribute ideas and respond to others</li> <li>contribute to a class TWLH chart</li> </ul>	<ul style="list-style-type: none"> <li>watch videos of sudden geological events</li> <li>articulate prior knowledge</li> <li>contribute to a class TWLH chart</li> </ul>	<ul style="list-style-type: none"> <li>class discussions</li> <li>TWLH chart contributions</li> <li>active participation</li> </ul>
<b>EXPLORE</b>	<b>2</b>	<ul style="list-style-type: none"> <li>demonstrate their current understanding of volcanoes</li> <li>conduct an experiment to simulate a volcanic eruption</li> </ul>	<ul style="list-style-type: none"> <li>communicate the links between the experiment and geological events</li> <li>effectively demonstrate their current understanding of volcanoes</li> </ul>	<ul style="list-style-type: none"> <li>conduct an experiment to simulate a volcanic eruption</li> <li>participate in final word to explain findings</li> </ul>	<ul style="list-style-type: none"> <li>student responses</li> <li>class discussions</li> <li>Science journal entries</li> </ul>
<b>EXPLAIN</b>	<b>3</b>	<ul style="list-style-type: none"> <li>compare their observations with factual data</li> <li>expand and demonstrate their understanding of volcanoes</li> <li>participate in group discussions</li> </ul>	<ul style="list-style-type: none"> <li>contribute ideas and respond to others</li> <li>reflect on personal understanding</li> </ul>	<ul style="list-style-type: none"> <li>review previous lessons</li> <li>use ICT resources to research volcanoes</li> <li>use findings to answer student generated questions</li> </ul>	<ul style="list-style-type: none"> <li>observation of student participation and responses</li> <li>TWLH chart contributions</li> <li>Science journal entries</li> </ul>
<b>EXPLORE</b>	<b>4</b>	<ul style="list-style-type: none"> <li>Use concrete materials to mimic/model convergent plate boundaries</li> <li>describe how tsunamis occur</li> <li>demonstrate understanding of plate tectonics with respect to earthquakes and tsunamis</li> </ul>	<ul style="list-style-type: none"> <li>effectively participate in group discussion</li> <li>reflect on personal understanding</li> </ul>	<ul style="list-style-type: none"> <li>explore and describe the features of tectonic plate movement</li> <li>explore the links between Earthquakes and tsunamis</li> </ul>	<ul style="list-style-type: none"> <li>observation of student participation and responses</li> <li>TWLH chart contributions</li> <li>Science journal entries</li> </ul>
<b>EXPLAIN</b>	<b>5</b>	<ul style="list-style-type: none"> <li>compare observations with factual data</li> <li>explain understanding of plate tectonics with emphasis on Australia and Asia</li> </ul>	<ul style="list-style-type: none"> <li>effectively participate in group discussion</li> <li>add to TWLH chart</li> </ul>	<ul style="list-style-type: none"> <li>review previous lessons</li> <li>small group work to answer student generated questions</li> <li>student findings recorded in science journal</li> </ul>	<ul style="list-style-type: none"> <li>observation of student participation and responses</li> <li>TWLH chart contributions</li> <li>Science journal entries</li> </ul>

<b>ELABORATE</b>	<b>6</b>	<ul style="list-style-type: none"> <li>Construct and use a range of representations, including tables and graphs to represent and describe observations, patterns or relationships in data using digital technologies as appropriate</li> </ul>	<ul style="list-style-type: none"> <li>Communicate ideas, explanations and processes in a variety of ways</li> <li>Work collaboratively as part of both small groups and in whole class discussions</li> </ul>	<ul style="list-style-type: none"> <li>plan and construct a poster or presentation that will apply and extend their conceptual understanding of dynamic Earth</li> </ul>	<ul style="list-style-type: none"> <li>observation of student participation and responses</li> <li>ability to compare and discuss data</li> </ul>
<b>ELABORATE</b>	<b>7</b>	<ul style="list-style-type: none"> <li>present their work to their peers</li> <li>justify their choices</li> <li>use scientific reasoning to explain their chosen concept</li> </ul>	<ul style="list-style-type: none"> <li>Communicate ideas, explanations and processes in a variety of ways</li> <li>Work collaboratively as part of both small groups and in whole class discussions</li> </ul>	<ul style="list-style-type: none"> <li>present their poster or presentation that will apply and extend their conceptual understanding of dynamic Earth</li> </ul>	<ul style="list-style-type: none"> <li>observation of student participation and responses</li> <li>poster or presentation</li> </ul>
<b>EVALUATE</b>	<b>8</b>	<ul style="list-style-type: none"> <li>describe and explain the causes and effects of Earthquakes and volcanoes on the Earth's surface</li> <li>describe and explain the links between Earthquakes and tsunamis</li> <li>reflect on new learning while making links with prior knowledge</li> <li>effectively communicate understanding</li> </ul>	<ul style="list-style-type: none"> <li>present understanding of sudden geological events orally and in writing</li> <li>reflect on their learning</li> <li>contribute to whole class and small group discussions</li> </ul>	<ul style="list-style-type: none"> <li>review unit content</li> <li>complete written test to demonstrate new learning</li> <li>reflect on learning obtained during this unit</li> </ul>	<ul style="list-style-type: none"> <li>written test responses</li> <li>science journal reflection</li> </ul>

## **Appendix 3.1 - Teacher approved web links**

### ***Primary Connections***

The link is a science background resource from Primary Connections regarding volcanoes and has very important factual information as well as helpful images, animated flash movie about hot spots and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/volcanoes/volcanoes.htm>

### ***National Geographic***

This link has further information about Volcanoes not Australia specific and contains some information on the human cost.

<http://environment.nationalgeographic.com/environment/natural-disasters/volcano-profile/>

### ***Volcano Facts for Kids***

This site is put out by fireplacespot.com and contains good general information not Australia specific but also has many links to other sites on volcanoes.

<http://www.fireplacespot.com/kids-volcano-facts>

## **Appendix 3.2 - Teacher approved web links**

### **Earthquakes**

This site put out by weatherwizkids.com has good, easy to read information with helpful images used to better explain the subject

<http://www.weatherwizkids.com/weather-volcano.htm>

### **Primary Connections**

The link is a science background resource from Primary Connections regarding tsunamis and has very important factual information as well as helpful images and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/tsunami/tsunami.htm>

### **National Geographic**

This link has important information about Plate Tectonics specifically the different classifications of tectonic shift (Convergent Boundaries, Divergent Boundaries, and Transform Boundaries).

<http://science.nationalgeographic.com.au/science/earth/the-dynamic-earth/plate-tectonics-article/>

### **National Geographic**

This link has further information about Earthquakes not Australia specific and contains some information on the human cost.

<http://environment.nationalgeographic.com/environment/natural-disasters/earthquake-profile/>

### **National Geographic**

This link has further information about tsunamis not Australia specific.

<http://environment.nationalgeographic.com/environment/natural-disasters/tsunami-profile/>

### **Australian Government Bureau of Meteorology Tsunami Facts and Information**

Australia specific but with a lot of junk information not of interest to the unit

<http://www.bom.gov.au/tsunami/info/>

### **50 Interesting Facts About . . . Tsunami**

This site put out by randomhistory.com contains 50 random facts about tsunamis, very text heavy and not Australia specific; Suitable only for advanced learners.

<http://facts.randomhistory.com/tsunami-facts.html>

### **Earthquake Facts**

This site is published by the U.S. Geological Survey and as the name suggest contains facts about Earthquakes again not Australia specific.

## **The Science of Earthquakes**

This site is published by the U.S. Geological Survey and as the name suggest contains facts about the science of Earthquakes again not Australia specific; however very useful diagrams.

<http://earthquake.usgs.gov/learn/kids/eqscience.php>

## **Earthquakes**

This site put out by weatherwizkids.com has good, easy to read information with helpful images used to better explain the subject

<http://www.weatherwizkids.com/weather-earthquake.htm>

## **Primary Connections**

The link is a science background resource from Primary Connections regarding Earthquakes and has very important factual information as well as helpful images and Australia specific data.

<http://www.science.org.au/primaryconnections/science-background-resource/data/Earth/sub/earthquake/earthquake.htm>



## Appendix 3.3 - Written test

1. Which part of the Earth is directly below the crust?
  - A. Mantle
  - B. Inner core
  - C. Outer core
2. Which part of the Earth is the hottest?
  - A. Mantle
  - B. Inner core
  - C. Outer core
  - D. Crust
3. What material makes up the mantle?
  - A. Iron
  - B. Magma
  - C. Nickel
  - D. Lava
4. A constructive or divergent plate boundary is when:
  - A. plates move together.
  - B. plates move apart.
  - C. plates slide past each other causing friction.
5. A destructive or convergent boundary is when:
  - A. plates move together.
  - B. plates move apart.
  - C. plates slide past each other.
6. At a conservative plate boundary land is:
  - A. destroyed.
  - B. created.
  - C. neither created or destroyed.
7. What occurrence is common along a conservative plate boundary?
  - A. Volcanoes
  - B. Earthquakes
  - C. Hurricanes
8. Which of these statements about a constructive boundary is NOT true?
  - A. Constructive boundaries are more commonly found on land than under the sea.
  - B. The Earth's plates are moving apart due to convection currents inside the Earth.
  - C. As the plates move apart (very slowly) magma rises from the mantle.
  - D. When the magma reaches the surface, it cools and solidifies to form a new crust of igneous rock.
  - E. Volcanoes often form at constructive boundaries.

9. The Himalayas were formed on what kind of plate boundary?

- A. Labour
- B. Constructive
- C. Liberal
- D. Destructive
- E. Conservative

10. The Mid-Atlantic Ridge or chain of volcanoes formed underneath the Atlantic Ocean is created by what kind of plate boundary?

- A. Labour
- B. Constructive
- C. Liberal
- D. Destructive
- E. Conservative

11. What is a volcano?

- A. The movement of the Earth's crust by the movement of plate boundaries
- B. A cone-shaped mountain or hill formed by eruptions of lava and ash
- C. A mountain created by the folding of the Earth's crust
- D. All of the above

12. Where do volcanic eruptions tend to take place?

- A. Conservative plate boundaries
- B. Destructive plate boundaries
- C. Constructive plate boundaries
- D. Constructive and destructive plate boundaries
- E. Constructive, destructive and conservative plate boundaries

13. A volcano that is flat and wide is called:

- A. a cone volcano
- B. a shield volcano
- C. a composite volcano

14. A cone volcano is most commonly found at which type of plate boundary?

- A. Destructive
- B. Constructive
- C. Conservative

15. Which type of volcano often erupts with a mix of steam, ash, rock and dust, causing a pyroclastic flow?

- A. shield
- B. cone
- C. composite

16. Which of the statements listed below is NOT a positive aspect of a volcanic eruption?

- A. The dramatic scenery created by volcanic eruptions attracts tourists.
- B. The lava and ash deposited during a volcanic eruption breaks down to provide valuable nutrients for the soil.
- C. Lava flows and lahars (mud flows) clear areas of woodland, agriculture and destroy settlements.
- D. The high level of heat and activity inside the Earth, close to a volcano, can provide opportunities for generating geothermal energy.

**17.** Which of the following is NOT a short-term response to an eruption?

- A. Building a volcanic observatory
- B. Evacuating people who may be affected by the eruption
- C. Aid from abroad
- D. Housing people in temporary shelters

**18.** A tsunami is:

- A. an earthquake caused by a large wave.
- B. an exceptionally high tide.
- C. a large wave caused by earthquake or volcanic activity under the ocean.

**19.** Which of the following is NOT true? When the tsunami reaches shallower water:

- A. the height of the waves can increase.
- B. the waves get closer together.
- C. the tsunami tends to speed up.

**20.** The main effect of a tsunami is:

- A. Flooding
- B. Drought
- C. Fire

## Appendix 4 - Criteria marking sheet



### EDCU201/261 Assessment 2: Earth & Space Sciences Unit

Student name: \_\_\_\_\_

CRITERIA	A	B	C	D	E
Overview	Introductory information and tables give a very clear and comprehensive overview of how the unit is structured. Alignment with the Australian Curriculum is clearly and unambiguously identified. Alignment is comprehensive, very relevant and meaningful. The interpretation of the Australian Curriculum demonstrates considerable originality and flair.	Introductory information and tables give a clear overview of how the unit is structured. Alignment with the Australian Curriculum is clear, relevant and meaningful. The interpretation of the Australian Curriculum demonstrates some originality and flair.	Introductory information and tables give a satisfactory overview of the unit. Alignment with the Australian Curriculum is satisfactorily articulated and is generally relevant.	Introductory information and tables are limited or difficult to follow. Evidence of alignment and relevance to the Australian Curriculum is lacking, irrelevant or is unclear.	An introduction/overview is not evident. Alignment with the Australian Curriculum is not evident.
Teacher background information	Teacher background information is very comprehensive, relevant and scientifically accurate. There is evidence of extensive research and critical reflection. There are no errors or omissions. An insightful and thorough summary of a wide range of potential student misconceptions is included.	Teacher background information is relevant and scientifically accurate. There is evidence of research and some critical reflection. A thorough summary of a range of potential student misconceptions is included.	Teacher background information is satisfactory being generally relevant and scientifically accurate. A summary of potential student misconceptions is included.	Teacher background information is limited, difficult to follow, or contains inaccuracies. The summary of potential student misconceptions is limited or irrelevant.	Teacher background information and summary of potential student misconceptions are not evident.
5E lesson plans	5 or more very well structured and organised lessons are provided. Lessons are clearly sequential and are an exemplary example of the 5E approach in action. Content and sequencing demonstrate a critical awareness of the needs of the target year level.	5 or more well-structured and organised lesson plans are presented. Lessons are sequential and clearly articulate the 5E approach. Content and sequencing are generally well matched and are appropriate for the target year level.	5 lesson plans that are generally well structured and organised. Lessons generally reflect the 5E approach. Concept development is adequately matched with target year level.	Lesson plans lack organisation/structure or do not reflect the 5E approach. Content and sequencing are not well matched with the target year level.	Less than 5 lesson plans. Lessons appear poorly planned and organised. Timing for most lessons is inappropriate. Instructional approaches do not match concepts being developed.
Learning activities	Concept development is creatively matched with well-crafted learning activities that are appropriate for the target year level. The activities appear to be very engaging and demonstrate considerable originality and flair. Required equipment list is comprehensive and very well organized.	Concept development is matched with learning activities that are appropriate for the target year level and demonstrate some originality and flair. Required equipment list is comprehensive and well organized.	Concept development is generally matched with suitable learning activities that are appropriate for the target year level. Required equipment list is satisfactory.	Concept development appears poorly matched with learning activities. The learning activities appear to be superficial or inappropriate. Equipment list is limited or unclear with errors or omissions.	Concept development through the use of suitable learning activities is not evident. Equipment list is not evident.
Communication	The overall structure and organization of the unit is of a very professional standard. A very high standard of English language is used and tables/diagrams/lesson plans are very clearly designed and the information is presented unambiguously.	The unit is well organised with information clearly presented through tables and text. A high standard of English language is used.	The unit is satisfactorily organized. An adequate standard of English language is used.	The unit appears to lack organization and/or structure. The unit contains many minor grammatical or spelling errors.	The unit is poorly organised and is very difficult to follow. The unit contains structural flaws and many serious grammatical or spelling errors.