Science Guide

Year 4

Here today, gone tomorrow

Unit 1

CURRICULUM INTO THE CLASSROOM
Independent Learning Materials

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Queensland Government

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Icon legend

Sheet	Keep	Prac work	Tutor/teacher	English Pack
Send-in	Digital	Safety	Maths Pack	Science Pack
Focused teaching and learning	Play learning situations	Real-life situations	Routines and transitions	Investigations

Contents

Here today, gone tomorrow

Unit 1: Lesson and resource overview

Here today, gone tomorrow

Unpacking video | Lesson notes and answers | Evidence of learning | Concept mapping | Starter Kit | Safety rules and Materials list

Exploring geological processes

Lesson 1: Mystery dig

Lesson objectives

- Understand that scientists recognise characteristics of soils and rocks which may affect weathering and erosion processes
- Select appropriate tools and techniques in order to effectively excavate

Helpful information

Supporting learning resource — Mystery dig preparation
Setting up a Science Journal
How to use a word wall

Resources

Digital

Video — Welcome to Geology! Part one (2:47)
Video — Welcome to Geology! Part two (2:04)
Learning object — Meet a scientist: Geologist [TLF L501]

Find and prepare

Sheet 1 — Geology dig record
Container with items buried in the soil, for example, a small toy, rock or household item. The soil can include wet sand, soft clay or Plaster of Paris
Tools for digging, for example, spoon, knife, paint brush, toothbrushes or small spade (gardening tools)
Digital camera
Science Journal

Negotiated tasks: Question — Reflection: Exercise 10 — Meet a scientist: geologist

Lesson 2: Rock hounds

Lesson objectives

- Understand that different rocks have different characteristics

Helpful information

Aboriginal peoples' and Torres Strait Islander peoples' understanding and use of rocks
Information for rock hounds

Resources

Digital

Video — Aboriginal peoples' and Torres Strait Islander peoples' use and knowledge of geology (1:57)
Video — The rock cycle (2:29)

Find and prepare

Sheet 2 — Rocks: True, false, not sure cards (cut out)
Sheet 3 — Igneous, sedimentary and metamorphic rocks picture chart
Sheet 4 — Rock hounds
Sheet 5 — The rock cycle
A collection of rocks (various size, shape, colour) from around the home or school
3 pieces of A3 cardboard to make a chart
Science Journal

Exploring geological processes (continued)

Lesson 3: The dirt on soil (1)

Lesson objectives
- Identify characteristics of different soil types

Resources

Find and prepare
Sheet 6 — Soil test investigation
Sheet 7 — Soil observations (Send-in)
Sheet 8 — Soil identification key
3 types of soil for shake test — preferably sandy soil, clay and gravel
3 glass jars with screw-top lids
Water
3 types of soil in separate trays (for squeeze test)
Plastic cup with water
Safety goggles or glasses
3 types of soil in separate trays (for close up examination)
Magnifying glasses
Protective mask
Gloves

Negotiated tasks: Question — Reflection: Exercises 6 and 7

Lesson 4: The dirt on soil (2)

Lesson objectives
- Identify characteristics of different soil types

Resources

Digital
Video — Aboriginal peoples use of ochres (1:49)
Video — Super soil (2:11)

Exploring weathering

Lesson 5: Researching types of weathering

Lesson objectives
- Understand that there are many different causes of weathering

Resources

Digital
Video — Weathering and erosion (2:15)
Sheet 9 — Weathering and erosion: True, false, not sure cards (cut out)
Sheet 10 — Weathering and erosion
True, false, not sure chart made from 3 pieces of A3 cardboard in Lesson 2

Lesson 6: Investigating types of weathering (1)

Lesson objectives
- Understand that different types of weathering change the Earth's surface

Helpful information
Weathering investigations

Resources

Digital
Video — Super ice (2:31)

Find and prepare
Sheet 11 — Weathering investigation activity cards (keep)

Experiment: Water power
One jar with screw-top lid
Water (enough to fill the jar)
1 ball of clay small enough to fit inside the jar

Experiment: Buff it up
Some rock samples soft enough to be abraded by sandpaper (if difficult, substitute the rock for sugar cubes)
1 rock or sugar cube
1 tray for the rocks
1 small (5 x 5 cm) piece of sandpaper
1 tray for collecting the debris from the sanding process

Exploring weathering (continued)

Lesson 7: Investigating types of weathering (2)

Lesson objectives
- Understand that different types of weathering change Earth's surface

Helpful information
Weathering investigations (from Lesson 6)

Resources

Find and prepare
Sheet 11 — Weathering investigation activity cards (from Lesson 6)

Science Journal

Experiment: Rockin' rocks
A container (preferably soft plastic) for shaking the mixture. Do not use glass.
Sugar cubes
Gravel

Experiment: Acid rain
1 sugar cube
Tray for placing sugar cube
Eye dropper
Plastic cup
Vinegar and water mixture — 10 ml vinegar to 20 ml water

Negotiated tasks: Question — Share information gathered: Exercise 4, 5 and 6

Exploring erosion

Lesson 8: Identifying erosion (1)

Lesson objectives
- Understand cause and effect relationships of erosion

Helpful information
Types of erosion

Resources

Digital
Slideshow — Types of erosion

Find and prepare
Sheet 12 — Erosion in my environment (Send-in)
Digital camera

Lesson 9: Identifying erosion (2)

Lesson objectives
- Understand cause and effect relationships of erosion
- Understand that actions can reduce or stop the impact of human activity on erosion

Resources

Find and prepare
Sheet 12 — Erosion in my environment (Send-in) (from Lesson 8)
Sheet 13 — Annotated diagram of erosion solution (Send-in)

Lesson 10: Uluru — Case study of erosion

Lesson objectives
- Identify erosion and its impacts on Uluru
- Propose solutions to reduce or stop erosion due to human activity at Uluru

Resources

Digital
Video — The Changing Face of Australia, 1970: Uluru (2:52) [TLF R826 9]
Slideshow — Case study: Uluru

Find and prepare
Sheet 14 — Case study: Uluru
Sheet 15 — Email template (Send-in)

Exploring erosion (continued)

Lesson 11: Investigating water erosion (1)

Lesson objectives
- Understand the cause and effect relationship of water erosion

Resources

Digital
Video — Erosion investigation (2:06)

Find and prepare
Sheet 16 — Erosion investigation instructions
Sheet 17 — Erosion investigation planner (keep)
Sand
Tray for sand — tidy trays are a good option for ease of cleaning
Sand mould — beach bucket or plastic cup
Small shovel or spade
Watering can
1 x one litre measuring jug
Water
Ruler
Tape measure
Digital camera (optional)

Lesson 12: Investigating water erosion (2)

Lesson objectives
- Understand the cause and effect relationship of water erosion

Resources

Digital
Video — Erosion investigation (2:06)
Learning object — Graph maker

Find and prepare
Sheet 16 — Erosion investigation instructions (from Lesson 11)
Sheet 17 — Erosion investigation planner (Part A completed in Lesson 11)

Lesson 13: Natural disasters and erosion

Lesson objectives
- Recognise how natural disasters can contribute to weathering and erosion

Helpful information
Natural disasters and erosion
Learning object — Weather — early years
Website — Behind the News: Archives
(if you have access to the internet)

Resources

Digital
Video — Natural disasters (1:37)
Slideshow — Wild weather!
Slideshow — Effects of earthquakes

Reviewing and assessment

Lesson 14: Review, reinforce and extend learning

No lesson plan provided for RRE

Lessons 15–18: Soil erosion investigation

Assessment purpose
To describe the natural process and human activity that causes changes to the Earth's surface. To plan, conduct and report on an investigation of the erosion process. Apply science understandings to formulate control strategies in real life situations.

Resources

Find and prepare
Assessment booklet — Soil erosion investigation (Send-in)
1 L water in a jug
2–3 rocks (size of a golf ball)
15 pebbles
1 cup of dry sand
Flat plastic tray, e.g. box lid
Small bucket
Tape measure or ruler
Other materials individually identified by students to construct an erosion prevention strategy

Reviewing and evaluating

Lesson 19: Colossal fossils

Lesson objectives
- Understand how fossils are revealed through weathering and erosion processes

Helpful information
Australian megafauna

Resources

Digital
Video — Colossal fossils! Part A (1:44)
Learning object — Get into geology [TLF L3063]
Learning object — Colossal fossils: the dig [TLF L2011]
Video — Colossal fossils! Part B (1:11)

Find and prepare
Sheet 18 — Fossils: True, false, not sure cards (cut out)
'True, false, not sure' chart (made in Lesson 2)
Science Journal

Negotiated tasks: Question — Reflection: Exercise 10

Lesson 20: Reviewing and evaluating the unit

Lesson objectives
- Evaluate the unit 'Here today, gone tomorrow'

Resources

Find and prepare
Sheet 19 — Unit evaluation (Send-in)

Negotiated tasks: These negotiated tasks are identified with a green dot and could be removed due to individual student ability and time commitment of families. Discuss these with the teacher.

Unit 1: Science safety rules

- A teacher/tutor must be present for, and supervise, all Science activities.
- Science activities should be conducted in a responsible and safe manner at all times. Most accidents are caused by ignorance, carelessness or not following instructions.
- Prepare for each Science activity session by reading through your work and having the materials ready *prior to the session*. Follow all instructions, including the safety instructions outlined in the lessons. Being prepared will help you avoid mistakes which lead to problems or poor outcomes.
- Students should immediately report all accidents such as spills, breakages, burns, fires and cuts to the tutor.
- Contact the teacher prior to commencement if you are unsure about any activity.
- Establish a clear and clean work space for activities, making sure there are no obstacles that could be tripped on.
- Safety glasses are to be worn during all Science activities to protect the eyes, even if the materials seem to be harmless.
- Wear protective clothing, such as aprons and gloves, where appropriate to protect clothing and protect against injury. Closed impervious shoes (for example, leather or plastic) should also be worn. This will provide protection against dropped objects and spilled chemicals. Do not wear sandals, open-topped shoes or shoes with canvas or woven uppers as chemicals can soak through and contact skin.
- Loose flowing hair should be held back with a hair tie, clip or ribbon. Remove any loose jewellery or earrings that could be a safety hazard by catching on equipment.
- Keep hands away from face, eyes and mouth while using chemicals and examining specimens. Wash hands with soap and water after all activities.
- Place a piece of wood or other material on the work space to prevent heat damage to the surface and to contain any spills or breaks.
- Read Material Data Safety Sheets (MSDS) provided prior to the activity, and have them on-hand during the activity session. If a chemical is spilt or splashes on clothes, follow any provided MSDS instructions for the best method to clean it up. Adding water may be a poor approach and cause injury.
- Do not eat or drink during activities.
- Only use equipment and materials for the purpose, and in the manner, outlined in the activity notes.
- Do not handle broken glass. Use a brush and dustpan to dispose of it appropriately.
- Remove electrical plugs from sockets after turning off electricity, grasping the plug by the end and not the cord.
- Ensure hands are dry when handling all electrical items including power points and globes.
- Heated metals and glass can remain very hot for a long time. Leave them to cool before cleaning or packing them away. If they need to be moved while still warm, then pick them up cautiously using tongs or heat-protective (oven) gloves.
- To prevent fumes or liquids entering the eye never look directly into a container being heated.
- To smell materials hold the container away from face, waft hand over the top of it to direct any smell or fumes toward your nose. Take only a shallow breath. Do not place nose directly above or into a container.

The Starter Kit also contains these *Science safety rules*, as well as additional information such as how to set up your own science 'laboratory', and special rules for heating liquids and heating/burning substances.

Be aware that additional safety notes specific to activities conducted in a lesson may also be outlined in the Science guide lesson notes or in the lesson itself.

The student and tutor need to sign the form and will be advised when to submit it to the teacher.

Agreement

I, _____ (student's name) have read and agree to follow all of the safety rules set forth in this contract. I realise that I must obey these rules to insure my own safety, and the safety of others. I will cooperate to the fullest extent with my tutor and teacher to maintain a safe environment. I will also closely follow the oral and written instructions provided by the tutor and teacher.

Student's signature _____

I, _____ (tutor's name) have read and understand all of the safety rules set forth in this contract.

Tutor's signature _____ Date _____

What if an accident happens?

A range of different kinds of accidents can happen during a Science activity, including:

- burns
- cuts
- acids on skin or clothes
- fires
- electrical shocks
- chemicals splashed into the eyes
- liquids swallowed.

You must tell a teacher or tutor *immediately* whenever any accident happens, even if it appears to you to be quite minor. Let them judge its severity. It is very important that the correct steps are taken if an accident occurs.

Please ensure that you know the location of:

- the nearest shower
- the nearest tap
- the electrical main switch
- the fire extinguisher
- the gas valve
- the exits
- the fire blanket or wet towel
- the dustpan and brush.

What do you do when …

- **your clothes are on fire?** Stop-Drop-Roll! Stop immediately, drop to the floor and roll. This is the quickest way to smother a fire. Cover the person with a fire blanket if available.
- **a person's clothes or hair is on fire?** Push them to the floor and roll them to try to put the flames out. Use a fire blanket, woollen jumper or towel if you can get to them quickly.
- **you burn yourself?** Immediately rinse the affected area with plenty of water from a tap. Follow the first aid instructions on the MSDS provided with the activity.
- **you spill a chemical on yourself?** Immediately rinse the affected area with plenty of water from a tap unless otherwise directed by the first aid instructions on the relevant MSDS provided with the activity.
- **a chemical comes in contact with your eyes?** DO NOT TOUCH THE EYE. Use running water to rinse the eye thoroughly and for a good period of time. Seek help from an adult.
- **a person appears to be experiencing an electric shock?** DO NOT TOUCH THEM. Turn the power off if you can reach the switch safely and quickly, otherwise turn off the main switch at the electricity box. Seek help from an adult.
- **you spill a chemical on the floor?** Keep everyone away from the area, and alert an adult immediately. Follow the clean-up instructions provided on the relevant MSDS provided with the activity.

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Materials and equipment list

Collect these resources to use in the unit. Some you will have at home, others you may need to purchase.

Lesson	Resources
Lesson 1	**Exploring geological processes — Mystery dig** • Container with items buried in the soil, for example, a small toy, rock, or household item. The soil may include wet sand, soft clay or Plaster of Paris • Tools for digging, for example, spoon, knife, paint brush, toothbrushes or small spade (gardening tools) • Digital camera
Lesson 2	**Exploring geological processes — Rock hounds** • A collection of various (size, shape, colour) rocks from around the home or school • 3 pieces of A3 cardboard to make a chart
Lesson 3	**Exploring geological processes — The dirt on soil** • 3 types of soil for shake test — preferably a sandy soil, clay and gravel • 3 glass jars with screw-top lids • Water • 3 types of soil in separate trays (for squeeze test) • Plastic cup with water • Sheet 8 — Soil identification key • Safety goggles or glasses • 3 types of soil in separate trays (for close up examination) • Magnifying glasses • Protective mask • Gloves
Lesson 5	**Exploring weathering — Researching weathering** • 'True, false, not sure' chart made from 3 pieces of cardboard in Lesson 2
Lesson 6	**Exploring weathering — Investigating types of weathering** <u>Water power</u> • 1 jar with a screw-top lid • Water (enough to fill the jar) • 1 ball of clay small enough to fit in the jar <u>Buff it up</u> • Some rock samples soft enough to be abraded by sandpaper (if difficult, substitute the rock for sugar cubes) • 1 rock or sugar cube • 1 tray for the rocks • 1 small (perhaps 5 cm^2) piece of sandpaper • 1 tray for collecting the debris from the sanding process

Materials and equipment list (continued)

Lesson	Resources
Lesson 7	**Exploring weathering — Investigating types of weathering** <u>Rockin' rocks</u> • 1 container (preferably soft plastic) for shaking the mixture • Sugar cubes • Gravel <u>Acid rain</u> • 1 sugar cube • Tray for the sugar cube • Eye dropper • Plastic cup • Vinegar and water mixture — 10 ml vinegar to 20 ml water
Lesson 11	**Exploring erosion — Investigating water erosion** • Sand • Tray for sand — tidy trays are a good option due to ease of cleaning • Sand mould — beach bucket or plastic cup • Small shovels or spades • Watering can or measuring jugs or cups • Water • Ruler • Tape measure • Digital camera (optional)
Lesson 16	**Review and assessment — Being a soil scientist** • Soil mixture that contains fine soil, gravel and small rocks • Flat surface that can be tilted, e.g. tray, board, tidy box • 1 litre of water • Metre ruler or tape measure (or other way to measure 1 metre)
Lesson 17	**Review and assessment — Being a soil scientist** • Bucket of water • 1 litre container • Metre ruler or tape measure (or other way to measure 1 metre) • Assessment booklet and a pencil to record what you see

Unit 1: Lesson notes and answers

This year students will be engaged in four units, developing science understandings in Biological sciences, Chemical sciences, Earth and Space sciences and Physical sciences. Each unit is allocated 20 lessons to be conducted over 10 weeks and will embed Aboriginal and Torres Strait Islander perspectives.

This unit, 'Here today, gone tomorrow' is an Earth and Space sciences unit. It has been allocated 20 lessons, one of which is an opportunity to revise, reflect or evaluate student progress or a chance to catch up on unfinished work. Students will explore the effect of human activity, natural disasters and extreme weather that causes weathering and erosion of the Earth's surface. Students relate this to their local area and predict consequences of future occurrences and human activity. They describe situations where science understanding can influence their own and others' actions. They suggest explanations for their observations and compare their findings with their predictions. Students discuss ways to conduct investigations and safely use equipment to make and record observations. Students will access Aboriginal peoples' knowledge about the changes to the Earth's surface and explanations for these. They will access Aboriginal peoples' and Torres Strait Islander peoples' knowledge of geology and explore geological evidence suggesting interactions between Aboriginal peoples and megafauna. The assessment booklet runs over four lessons and is an investigation of erosion.

Throughout this unit students will be conducting investigations and are advised to follow safety precautions.

Note: Please watch the Unpacking video for an overview of the unit. A link to this video can be found on the Lesson and resource overview.

Lesson concept key

N New	O Ongoing	A Assessment
O A Ongoing and building for assessment	N M New and building for monitoring	O M Ongoing and building for monitoring
N A New and building for assessment		

Lesson 1: Mystery dig

Lesson concepts

- Earth's surface changes over time due to natural processes and human activity
- Appropriate equipment should be used safely to make and record observations
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students confusing geologists with palaeontologists or archaeologists. Review explanation of a geologist and compare with definitions of palaeontologists and archaeologists. A geologist is a scientist who studies the solid and liquid matter that constitutes the Earth as well as the processes that has shaped it. Palaeontology is the study of prehistoric life. It includes the study of fossils to determine organisms' evolution and interactions with each other and their environments. Archaeologists study human activity in the past, primarily through the recovery and analysis of the items and environmental data they have left behind, which includes artefacts, architecture and cultural landscapes
- students using forceful techniques. Review matching techniques and tools to purpose. Some tools are more appropriate for the initial dig and other tools are suited to excavating when care needs to be taken around the fossil.

Students will be exposed to terms such as: geologist, soil, dirt, techniques, excavate, characteristics, geology, artefact, prospect, fossick, in situ, weathering and erosion.

Suggested next steps for learning:

- Please read **Helpful information — Mystery dig preparation** for more information about how to set up the dig.

Lesson notes

For this lesson students will need to have a container with items buried in soil, for example, small toy, rock or household item, prepared before the lesson. The soil may include wet sand, soft clay or Plaster of Paris. They will need tools for digging, for example, spoon, knife, paint brush, toothbrushes or small spade (gardening tools) and a digital camera (if possible).

Helpful information

Mystery dig preparation

Setting up a Science Journal

How to use a Word wall

Lesson answers

1–2. No Answer required

3. Answer recorded on **Sheet 1 — Geology dig record**

4–6. No Answer required

7. a) Answers will vary but students will likely respond with easy or difficult (which relates to experience and type of soil in the tray)

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b)

Soil type	Tools	Reason
Loose soil	Dustpan and brush	Since the soil is loose it can readily be brushed up into the dustpan and removed from the site. The shovel can be used to readily shovel up large amounts of soil to dig down to the place where the objects are located.
Hard clay	Pickaxe and chisel	Hard clay cannot be brushed away and is difficult to shovel away. A chisel is useful in helping to break off small pieces of clay and the pickaxe is appropriate to be used since it can be applied with a lot of force so that it is effective at removing large chunks of clay.

c) The hard clay holds together tightly, so it is difficult to break apart and remove. Tools such as spades, chisels and hammers or pickaxes often need to be used. Particular care has to be taken so that the artefacts or fossils are not damaged when using these tools. Sand is made up of loose grains which is much easier to brush or scoop up and remove.

d) Geologists would need to understand the type of rock or soil they are dealing with. The characteristics of the ground material will help determine the type of excavation techniques and tools that should be used. Very soft material could be scooped or brushed away. Hard material may require forceful digging and the use of powerful tools.

8–11. No answer required.

Lesson 2: Rock hounds

Lesson concepts

- Earth's surface changes over time due to natural processes
- Appropriate materials and equipment should be used safely to make and record observations
- Data is represented and used
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students classifying rocks according to their size, that is, as rocks, boulders, stones or pebbles. Remind students of the geological classification scheme of rocks based on their origin and composition
- students thinking that all rocks are the same. Remind students that there are different types of rocks
- students thinking that rocks must be heavy. Explain to students that some rocks are light, such as pumice.

Students will be exposed to terms such as: clast, extract, crystals, minerals, sedimentary, igneous, metamorphic sediments, magma, compression, compaction, cementation, cooling, melting, pressure, weathering and erosion.

Embedding Aboriginal and Torres Strait Islander histories and cultures

Students will access Aboriginal peoples' and Torres Strait Islander peoples' use and knowledge of geology and discuss how this knowledge of relationships between rock types and their properties allowed for the fashioning of specific tools.

Lesson notes

Students will need to collect different rock samples from around their home to use in this lesson.

In question 5, have students choose examples of rocks from **Sheet 3 — Igneous, sedimentary and metamorphic rocks picture chart** to complete **Sheet 4 — Rock hounds** if they were unable to collect enough rocks of their own.

Read Lesson 3 and **Sheet 6** to determine what can be prepared prior to the lesson.

Lesson answers

1. No answer required
2. Students will review their answers to **Sheet 2** during Step 10 of the lesson.
3. No answer required
4. No answer required
5. Students complete **Sheet 4 — Rock Hounds**. See **Answer Sheet 4** for a sample response.
6. No answer required
7. No answer required
8. Students draw a rock cycle diagram. See **Sheet 5 — The rock cycle** for an example.
9.
   a) sedimentary, igneous, metamorphic
   b) different colours, coloured bands, holes or bubbles, crumbly or flaky, crystals
   c) Metamorphic rocks change to igneous rocks through melting and cooling.
      Igneous rocks change into sedimentary rocks through weathering and erosion.
      Sedimentary rocks change into metamorphic rocks through heat and pressure.
   d) Aboriginal peoples and Torres Strait Islander peoples use rocks and stones to make tools, cut meat and plants, barb spears, cut bark from trees, make ceremonial tools, scrape and clean animal skins and grind food and ochre.
   e) Aboriginal peoples and Torres Strait Islander peoples select rocks and stones based on their characteristics. Sandstone is used to grind and shape new tools because it has a rough surface and is quite soft.
10. See **Answer Sheet 2**.
11. No answer required

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Lesson 3: The dirt on soil (1)

Lesson concepts

- Earth's surface changes over time due to natural processes
- Appropriate materials, tools and equipment are used to make and record observations
- Data is represented and used
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that soils have been in their present form forever. Remind students that there are a number of different soils, and soils also move through a soil-making process
- students thinking that all soil is the same. Remind students that soil is more than a result of the weathering of rock but is also made of organic matter and living things.

Students will be exposed to terms such as: soil, clay, loam, ochre, pigment, silt, topsoil, subsoil, eluviation, bedrock and humus.

Lesson notes

In this lesson students will be conducting investigations on soil. It is recommended that all materials be prepared prior to the lesson. It may be helpful to create different areas that have all the materials needed for a particular investigation set up together. Students may then be able to move from one area to the next to conduct the investigations. Please warn students of any safety concerns prior to conducting the investigation. Be sure to use gloves, goggles and a mask when handling soils. Some soil you may find could include sandy soil from the sand pit, gravel/dirt, loam soil from garden beds, clay or muddy soil.

If additional time is required, complete the lesson at the beginning of Lesson 4 (which is shorter in length).

Due to safety concerns surrounding airborne particles do not use potting mix for this activity.

Lesson answers

1. Answers may vary. This is an opprtunity for students to share thier prior understanding. Soil is made from small pieces of rock which have been broken down by weathering. Soil is the top layer of ground. Soil also contains organic matter and living things. Soil is dirt.
2. No answer required
3. No answer required
4. Answers are provided on **Answer Sheet 7 — Soil observations** for the teacher only.
5. Responses will vary but may include references to particle/grain size, stickiness, ability to hold water, lumpiness, texture and so on.
6. Answers will vary depending on experiences. Responses may include:
   - I didn't know that there were so many characteristics of soil.
   - I didn't know that living things make up soil.
   - I thought all soil was the same.
   - I didn't think of sand as a type of soil.
7. No answer required.

Lesson 4: The dirt on soil (2)

Lesson concepts

- Earth's surface changes over time due to natural processes
- Data is used
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that soils have been in their present form forever. Remind students that there are a number of different soils, and soils also move through a soil-making process
- students thinking that all soil is the same. Remind students that soil is more than a result of the weathering of rock but is also made up of organic matter and living things.

Students will be exposed to terms such as: soil, clay, loam, ochre, pigment, silt, topsoil, subsoil, eluviation, bedrock and humus.

Embedding Aboriginal and Torres Strait Islander histories and cultures

Students will investigate Aboriginal peoples' and Torres Strait Islander peoples' knowledge of geology as it relates to pigments, ochres and charcoal used in artwork and ceremony.

Lesson answers

1. No answer required
2. Ochre has strong colours and can be ground up to be very fine so that it has no lumps when water is added.
3. Aboriginal peoples and Torres Strait Islander peoples use ochre for ceremonial body painting, rock art and for decorating tools.
4. Responses will vary but may include: pigment can be added to create different colours for painting, easy to wash off body, easy to crush, and Aboriginal peoples and Torres Strait Islander peoples may find ochres easily.
5. Responses will vary but may include: when mixed with water ochre can wear off easily, and it may be hard to get the different colours of ochre as limited colours are available.
6. No answer required
7. Responses will vary but may include: reference to how different type of soils erode differently, and the speed or type of erosion.
8. Responses will vary but may include: hard lumpy soil may not move very easily but fine soil would be lighter and move more easily.
9. No answer required

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Lesson 5: Researching types of weathering

Lesson concepts

- Earth's surface changes over time due to natural processes
- Appropriate equipment should be used to make and record observations
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that rocks cannot or do not change. Remind students that rocks are able to change both their physical and chemical characteristics through the process of weathering
- students thinking that geological processes mainly happen quickly. Inform students that geological processes can happen over short and long periods of time
- students thinking that weathering and erosion are the same thing. Remind students that weathering involves a process whereby rocks undergo changes and break down. However, erosion is the movement of weathered material from one place to another
- students thinking that weathering and erosion are only dependent on human involvement. Remind students that these are natural processes which can be affected by human activity.

Students will be exposed to terms such as: physical, weathering and erosion.

Lesson notes

You may need to read through **Sheet 10 — Weathering and erosion** with your student to enable a solid understanding of weathering and erosion.

Lesson answers

1. No answer required
2. No answer required until completion of the lesson
3. Students read **Sheet 10 — Weathering and erosion** and highlight information.
4. These are sample responses to **Sheet 10 — Weathering and erosion.**

Weathering and erosion table		
What is the difference between weathering and erosion?	**Weathering** This is the breaking down of rocks into smaller pieces.	**Erosion** This is when the small pieces of rock are picked up and moved to a different location by wind and rain.
How do wind and water cause weathering?	**Draw a labelled diagram or write your explanation** Wind and water move smaller grains of rock and sweep them over larger rocks. These grains rub against the rock and break it up into smaller pieces and make it smoother.	
How do heat and cold cause weathering?	**Draw a labelled diagram or write your explanation** Rocks that are repeatedly heated up to high temperatures and cooled down to very low temperatures, expand and contract which can cause them to crack.	

Weathering and erosion table		
How do plants and animals cause weathering?	**Draw a labelled diagram or write your explanation** Plant roots can grow into cracks in the rock and crack them apart. Some plants like lichen or moss grow on the top of rocks breaking them up. An animal can burrow or trample rocks and break them apart.	
What is the difference between chemical and physical weathering?	**Chemical** This is when rocks are broken up because their composition changes when exposed to a mixture of water and air.	**Physical** This is when rocks break apart because of physical forces such as wind, water and temperature changes.

5. No answer required
6. Students complete **Sheet 9 — Weathering and erosion: True, false, not sure cards**. Answers are provided on **Answer Sheet 9**.
7. No answer required

Lesson 6: Investigating types of weathering (1)

Lesson concepts

- Earth's surface changes over time due to natural processes
- Questions can be investigated and predictions made
- Investigations are planned and conducted to answer questions
- Appropriate materials and equipment should be used safely to make and record observations
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that weathering and erosion are the same thing. Remind students that weathering involves processes by which rocks exposed to the weather undergo changes and break down. However, erosion is the movement of weathered material from one place to another
- students thinking that geological processes mainly happen quickly. Remind students that these processes can occur over short and long periods of time.

A 'concept map' is a diagram showing the students' knowledge with ideas, images or words. It is a graphical tool for organising this information and showing the relationships among concepts. With each branch and new idea they may have some more knowledge related to that concept which will then branch off again. In this context it is used to brainstorm and map the student's ideas.

Students will be exposed to terms such as: physical, mechanical, weathering and erosion.

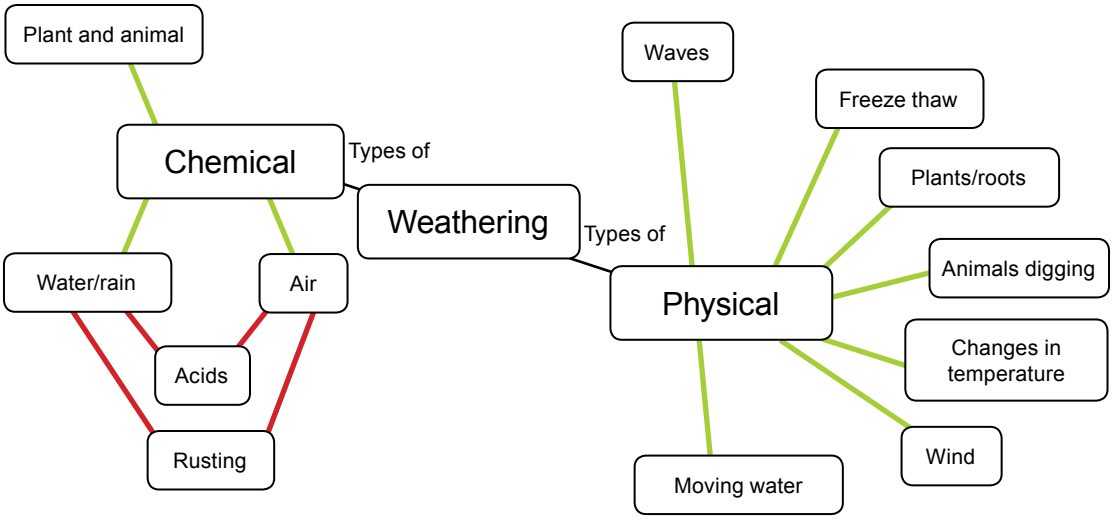
Lesson notes

Students will be conducting investigations into types of weathering over the next two lessons. It is recommended that all materials are prepared prior to the lesson. It may be helpful to set up areas (tables) that have all the materials needed for a particular investigation set up together. Students may then be able to move from one place to the next to conduct the investigations. Please warn students of any safety concerns prior to conducting the investigation.

Read **Helpful information — Weathering investigations** for more information and a list of resources for each investigation.

Lesson answers

1. Example of a completed mind map.



2.

a) Answers will vary. Sample response: I think the water will freeze and the plate will be lifted up by the frozen water.

3. Responses for the investigations — *Water power* and *Buff it up* are written in the Science Journal. Sample responses are provided below.

Water power

Prediction: I think the clay will become really smooth because the water will smooth it out like pebbles in a river.

Observations: Responses will vary. They could include:

- Small cracks appeared on the ball of clay.
- Pieces of clay came off the ball.
- The water became cloudier because of the small particles floating in the water.
- Small dents can be seen on the ball of clay.
- Some patterns have been made on the surface of the ball.

Why do you think this happened? Responses will vary but should include reference to the action of the water breaking down the ball of clay. The students may also notice that the ball of clay is affected more on the 2nd swirling of the jar because there are more particles rubbing and hitting the ball of clay.

Describe how this investigation models physical weathering.
The swirling of the clay models stones being tumbled down a river. Also, the movement of water against the clay and pieces of clay in the water striking against the ball, model the water and sand in the water abrading the surface of stones to make them smoother.

Buff it up

Prediction: I think the edges of the soft rock will wear down first because they are the most exposed.

Observations: Responses will vary. They could include:

- The soft rock was worn away where the sandpaper rubbed it.
- Small bits of the rock fell away into the tray.
- When it was rubbed harder more of the rock broke off.
- The rock became smaller after it was rubbed.

Why do you think this happened? Responses will vary but should include reference to the rough sandpaper rubbing against the rock and causing it to break up. The rock became smaller because the bits of rock were breaking off.

Describe how this investigation models physical weathering.
This investigation shows physical weathering from small particles rubbing on soft rocks (some students may be able to list soft rocks such as sandstone) and causes little pieces to break off and fall away. This is what happens when wind blows against rocks. There are small particles in the wind that rub against or abrade the rock, like the sandpaper, causing small pieces of the rock to break off.

4. No answer required

Lesson 7: Investigating types of weathering (2)

Lesson concepts

- Earth's surface changes over time due to natural processes
- Questions can be investigated and predictions made
- Investigations are planned and conducted to answer questions
- Appropriate materials and equipment should be used safely to make and record observations
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that weathering and erosion are the same thing. Remind students that weathering involves a process whereby rocks exposed to the weather undergo changes and break down. However, erosion is the movement of weathered material from one place to another
- students thinking that geological processes mainly happen quickly. Remind students that these processes can occur over short and long periods of time.

Students will be exposed to terms such as: physical, mechanical, weathering and erosion.

Lesson notes

In the *Rockin' rocks* investigation students are asked to shake sugar cubes and gravel/pebbles in a plastic jar. *Do not shake pebbles in glass as it is considered high-risk.*

Read **Helpful information — Weathering investigations** for more information and a list of resources for each investigation.

Lesson answers

1. No answer required
2. Sample responses for the investigations — *Rockin' rocks* and *Acid rain*.

Rockin' rocks

Prediction: I think the sugar cubes will break apart because the rocks bang against them, and some small fragments of the rocks will also break off after they strike each other.

Observations: Responses will vary. They could include:

- Sugar cubes had cracks appearing on them.
- There was no change to the rocks.
- White marks could be seen on the rocks.
- The edges of the sugar cubes had pieces broken off.
- The sugar cubes had big cracks in them.
- Part of the sugar cubes broke off.
- There is not much of the sugar cubes left.

Why do you think this happened? Responses will vary but should include reference to the action of the moving gravel/rocks breaking down the sugar cubes. The rocks were hitting the soft sugar cubes and they began cracking and then falling apart.

Describe how this investigation models physical weathering.
This investigation shows physical weathering like it would be if caused by moving water or wind. The hard rocks hit the soft sugar which is like a softer rock. As the rocks hit the sugar, the sugar begins to crack and then split or break apart. The edges are the first to break because they are less protected and stand out more.

Acid rain

Prediction: I think the vinegar will create a hole in the sugar cube because the vinegar is an acid and acids eat through things.

Observations:

- The vinegar seemed to eat away at the sugar cubes breaking it up.
- A hole formed where the vinegar landed.

Why do you think this happened? Responses will vary but should include reference to the chemicals in the vinegar breaking up the sugar. The students may refer to the chemicals reacting with the sugar, causing a hole to be created.

Describe how this investigation models chemical weathering.
This investigation models chemical weathering because the vinegar is a chemical and the sugar has been changed by the vinegar. This is like some chemicals which can be found in water or air. There is such a thing as acid rain which eats away at soft rocks just like the sugar cube.

3. There were two types of weathering investigated — physical weathering and chemical weathering. The acid rain investigation was the only example of chemical weathering. The super ice experiment modelled freeze thaw and showed how expanding ice can be very strong. The other examples of physical erosion were all abrasive erosion where small particles rub on a rock and break it down like sandpaper. Some were from moving water and others were like wind blowing on soft rocks.
4. Three of the weathering processes which were modelled were very similar because they looked at abrasive weathering. This is where small particles rub on rocks due to running water or wind. The three investigations were *Rockin' rocks*, *Buff it up* and *Water power*. The fourth process was chemical weathering. This was the acid rain investigation and was very different because it modelled chemical weathering to break down the rocks.
5. Answers may vary. Sample response: The gradual breaking down of a rock by physical means such as wind, water or temperature changes.
6. Chemical weathering is when rock is gradually broken down by naturally occurring chemicals. This can be like acid rain.

Lesson 8: Identifying erosion (1)

Lesson concepts

- Earth's surface changes over time due to natural processes and human activity
- Science involves describing relationships
- Questions can be investigated
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students' thinking that erosion is only dependent on human involvement. Remind students that these are natural processes which can be affected by human activity
- students thinking that all erosion is bad. Inform students that some erosion can be good for the land.

Students will be exposed to terms such as: erosion, erode, rill, glacial, sheet and gully erosion, landslides, creep erosion, saltation and suspension.

Lesson notes

This lesson will be looking at the cause and effect relationship of erosion, as well as understanding actions that can reduce or stop the impact of human activity on erosion.

Send-in task: **Sheet 13 — Annotated diagram of erosion solution**.

For more information on types of erosion see **Helpful Information — Types of erosion**.

Lesson answers

1. Responses will vary. This is to determine prior knowledge.
2. No answer required

3. Answers may vary E.g.
   a) wind, water, glaciers, waves
   b) Responses will vary but may include: shape landforms, create patterns, create gullies, landslides, make it hard to grow things, change the shape of them.
4. No answer required
5. Students complete **Sheet 12 — Erosion in my environment**. Answers are provided only to the teacher.
6. Responses will vary but should include some consideration about natural forces and may include some consideration of human activities.
7. No answer required

Lesson 9: Identifying erosion (2)

Lesson concepts

- O M O A Earth's surface changes over time due to natural processes and human activity
- O O M Science involves describing relationships
- O M O A Questions can be investigated
- O M O A Ideas and findings can be communicated

Learning alerts

Be aware of:

- students' thinking that erosion is only dependent on human involvement. Remind students that these are natural processes which can be affected by human activity
- students thinking that all erosion is bad. Inform students that some erosion can be good for the land.

Students will be exposed to terms such as: erosion, erode, rill, glacial, sheet and gully erosion, landslides, creep erosion, saltation and suspension.

Lesson answers

1. Responses will vary, depending on the area studied.
2. Responses will vary but might include: natural forces such as water, wind, animals. Human activities may also be included as a contributing cause, for example, people walking in the area, people removing plants, or people driving on the area. Identify areas of erosion which human activity may have contributed to.
3. Responses will vary. Example responses are below. Not all rows need to be completed.

Area	How humans contributed
Play area	The grass has been worn down because people have been taking a short cut and walking on it.
Lawn area in front of house	The ground has been dug up and the grass worn away because cars park on it.

Area	How humans contributed
Soil collected on the cement below the garden	Because the garden has no plants in it and it is just exposed soil, every time it rains the soil is washed away and collects on the cement.
Creek bank	The bank of the creek has cracks in the soil and the roots of some of the trees are exposed. Humans have impacted on this site because they have removed a lot of the grasses along the creek bank.
Beside the driveway	There is a big rut beside the cement driveway because the cars sometimes miss the driveway and drive onto the ground, wearing the grass away and removing soil.
River bank	Gullies have formed down to the river bank because cars have been driven over the area. The broken soil is then carried into the river by rain.

4. Answers will vary. Sample answer: The soil which is being washed away from the garden is causing a problem because there is soil collecting on the concrete in the outdoor area. This makes the area messy and when it rains it gets muddy and more washes down.
5. No answer required
6. Students complete **Sheet 13 — Annotated diagram of erosion solution**. No answers are provided as this is a Send-in task
7. Answers will vary. Sample answer: Measure the amount of soil collected. Check the area after a few months to see if any more soil has collected on the cement. If there is some soil, it would need to be measured to see how much there is and if there is more then there was before.
8. No answer required

Lesson 10: Uluru — Case study of erosion

Lesson concepts

- OA — Earth's surface changes over time due to natural processes and human activity
- OA OM — Science knowledge helps people to understand the effect of their actions
- OA — Investigations are planned to answer questions
- OA OM — Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that Uluru is a monolith. Inform students that Uluru is an inselberg which is an isolated remnant left after the slow erosion of an original mountain range
- students thinking weathering and erosion are only dependent on human involvement. Remind students that these are natural processes which can be affected by human activity.

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Students will be exposed to terms such as: weathering, erosion and inselberg. An inselberg or an island mountain is the isolated remains left after the slow erosion of an original mountain range.

Embedding Aboriginal and Torres Strait Islander histories and cultures

Students will examine the impact of human activities on erosion on and around Uluru while also considering the cultural and sacred significance of this site for the Anangu Aboriginal people.

Lesson notes

The Send-in task for this lesson is **Sheet 15 — Email template**.

This is a short email demonstrating what they have learned about the action that needs to be taken to preserve the site. It should show their understanding of what can reduce or stop soil erosion. Don't spend too much time on this task.

Lesson answers

1. Natural forces such as water, wind and animals can cause erosion. Human activities may also be included as a contributing cause, for example, people walking in the area, people removing plants, and people driving on the area.
2. Erosion can be reduced by planting vegetation, stopping people from walking on erosion-prone areas, creating run-off barriers, windbreaks or covers like gravel.
3. Humans can impact on erosion through recreational activities, building and construction, beach development, farming, deforestation, mining and burn offs.
4. No answer required
5. No answer required
6. The video shows erosion of Uluru through the actions of water.
7. No answer required
8. Students complete **Sheet 14 — Case study: Uluru**. See sample responses on **Answer Sheet 14.**
9. If erosion of Uluru continues as it is, its shape and appearance will noticeably change. Sections could start breaking off, changing the shape of the landform completely, and the path could become more substantial and visible.
10. To reduce the erosion on Uluru tourists could be stopped from walking over it. This will reduce the erosion due to human impact. If the sacred site is preserved this may reduce the distress to the Anangu people because the visitors will be kept safe and the responsibility to care for their country is upheld.
11. Students complete the Send-in task on **Sheet 15 — Email template**. No answers are provided for the Send-in task. The teacher will provide feedback.
12. No answer required

Lesson 11: Investigating water erosion (1)

Lesson concepts

- Earth's surface changes over time due to natural processes and human activity
- Science involves making predictions and describing relationships
- Science knowledge helps people to understand the effects of their actions
- Questions can be investigated and predictions made
- Appropriate equipment should be used safely to make and record observations
- Data is represented and used to identify patterns
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking weathering and erosion are the same thing. Remind students of the differences between weathering and erosion.

Students will be exposed to terms such as: erosion, erode, investigate, observe, cause-and-effect and annotate.

Lesson notes

Students will complete an investigation on water erosion.

Read **Sheet 16 — Erosion investigation instructions** for more information and a list of resources.

Remember to be sun safe when outside conducting an investigation. Students will need to take their sheet, Science Journal and pencil with them when conducting this investigation.

In Lesson 12 students will use the results from this lesson for the second part of the investigation — analysing and presenting the results.

Lesson answers

1. Answers can include water, wind, waves, ice, animal activity or human activity.
2. No answer required
3. No answer required
4. No answer required
5. Students use **Sheet 17— Erosion investigation**. See sample response on **Answer Sheet 17**.

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Lesson 12: Investigating water erosion (2)

Lesson concepts

- OA Earth's surface changes over time due to natural processes and human activity
- O Science involves making predictions and describing relationships
- OA Science knowledge helps people to understand the effects of their actions
- OA Questions can be investigated and predictions made
- O Data is represented and used to identify patterns
- OA Results can be explained and compared with predictions
- O Investigations can be reflected upon to determine fairness
- OA Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking weathering and erosion are the same thing. Remind students of the differences between weathering and erosion

Students will be exposed to terms such as: erosion, erode, investigate, observe, cause-and-effect and annotate.

Lesson answers

1. No answer required
2. No answer required
3. No answer required
4. No answer required
5. Students complete **Sheet 17 — Erosion investigation planner**. See sample response on **Answer Sheet 17.**
6.
   a) If it was poured more slowly it would have probably eroded less sand. If it was poured more quickly there would have been more force from the water and it would have eroded more.
   b) soil: The soil castle would have been smaller than it was before the water was poured in, but it would show less erosion than the sandcastle because the soil may contain clumps and more twigs and plant material that may reduce the erosion caused by the flow of water. The clumps of soil would be heavier and therefore less likely to be moved by the water, and the plant material may hold the 'castle' together more.
   c) clay: The clay castle would be a bit smaller than it was before the water was poured in, but it would show much less erosion than the sandcastle or soil castle because the clay particles stick together more than sand or soil. Water may flow over the surface rather than seeping into the castle as it did with the sand.
   d) The water would have followed that path and that would have been the first place that was eroded away. Maybe not as much would have eroded because it had somewhere to go.

e) The landscape is shaped by erosion. It is how hills and mountains have their shape. It is how rivers and beaches are formed. It is why we have gullies and why creeks follow the path they do.

f) wind, plants, weathering of the landscape, animals, humans, temperature

g) The model shows us how erosion works and we could use this understanding to try and minimise the effect of erosion. We could add other elements to the model, like plants or barriers to see if we could minimise the amount of erosion.

Lesson 13: Natural disasters and erosion

Lesson concepts

- Earth's surface changes over time due to natural processes and human activity
- Science involves making predictions and describing relationships
- Ideas and findings can be communicated

Learning alerts

Be aware of:

- students thinking that tsunamis are caused by cyclones. Inform students that tsunamis are caused by earthquakes, volcanic eruptions, underwater explosions, mass movement, glacial calving and meteoric ocean impacts
- students thinking that earthquakes are caused by volcanic eruptions. Inform students that most earthquakes are caused by a sudden tremor or movement of the Earth's crust
- students thinking that cyclones, hurricanes and typhoons are all different types of extreme weather events. Inform students that they are all the same type of weather event, with different names according to region.

Students will be exposed to terms such as: cyclone, flood, hail, tornado, earthquake, tsunami, volcanic eruption, bushfire, storm surge, extreme and hurricane.

Lesson answers

1. Answers will vary. A natural disaster is a major adverse event resulting from natural processes of, or affecting, the Earth. It can include loss of life, injury, economic loss and environmental damage. Cyclones, floods, tsunamis, volcanoes, earthquakes, droughts, bushfires/wildfire, hail storm, landslides and tornadoes are natural disasters.
2. Answers may vary but could include: cyclones, floods, drought, hail storms and tornadoes are caused by extreme weather.
3. No answer required
4. plants stripped of leaves, cars damaged, buildings damaged, trees and power lines knocked over, roofs blown off
5. No answer required
6. Image 5: second story of a building blown onto the street

   Image 6: shed blown over

   Image 7: house off its foundations, mud covering concrete

   Image 8: playground covered with water, debris moved to the edge of water

   Image 9: air full of red dust

7.

a) Answers may vary. Sample responses include: soil, plants, rocks and debris disturbed and moved, buildings damaged, erosion.

b) The main agents of erosion are wind, water and waves. During an extreme weather event these agents are made much stronger so the effects are worse.

8. No answer required

9. An earthquake can split the ground and cause more rocks to come loose which can be taken away by the agents of erosion. It could also tear up trees which are keeping the ground together. Earthquakes could also cause tsunamis which are giant waves which could cause a lot of erosion to beaches.

10. Bushfires could wipe out all of the vegetation and if it rains before it can regrow it would cause a lot of erosion as the soil has nothing to hold onto. Volcanoes could break down trees and spread ash all over everything, leaving the vegetation dead and the soil with no protection. The lava could also actually erode the landscape. Droughts can cause vegetation to dry up and die and then the topsoil is exposed and can blow away in the wind.

Lesson 14: Review, reinforce and extend learning

Review, reinforce and extend learning lessons can be removed from your timetable or combined to give you greater flexibility during the unit. These times can be used to complete unfinished work or review concepts. Please contact the teacher for further advice.

Lessons 15–18: Soil erosion investigation

Lesson concepts

- A Earth's surface changes over time due to natural processes and human activity
- A Science knowledge helps people to understand the effects of their actions
- A Predictions can be made
- A Investigations are planned and conducted to answer questions
- A Appropriate materials, tools and equipment should be used safely to make and record observations
- A Results can be explained and compared with predictions
- A Ideas and findings can be communicated

Lesson notes

Over the next four lessons students will be completing an assessment task about how natural processes and human activity change the surface of the Earth. They will complete the **Assessment booklet — Soil erosion investigation**. The *Guide to making judgments* marking guide attached to the booklet will be used to mark students' work.

It is recommended that students complete a section of the booklet each lesson during the four lessons as follows:

Lesson 15: Section 1 — Surface Changes

Lesson 16: Section 2 — Modelling erosion investigation

Lesson 17: Section 3 — Controlling erosion

Lesson 18: Section 4 — Designing and testing a modelled solution to erosion

For Section 2, students will need the following materials:

- 1 L water in a jug
- 2–3 rocks (size of a golf ball)
- 15 pebbles
- 1 cup dry sand
- Flat plastic tray, e.g. box lid
- Small bucket

For Section 4, students will need the same materials, along with any other materials they identified that they will need to construct their erosion prevention strategy.

The **Assessment booklet — Soil erosion investigation** will need to be sent in at the completion of Lesson 18

Lesson 19: Colossal fossils

Lesson concepts

- Earth's surface changes over time due to natural processes
- Appropriate equipment should be used safely to make and record observations
- Findings can be communicated

Learning alerts

Be aware of:

- students thinking that fossils are actual pieces of dead animals and plants. Inform students that fossils are the preserved remains of an organism
- students thinking that all fossilised bone must be from dinosaurs. Inform students that not all bones found come from dinosaurs.

Students will be exposed to terms such as: fossil, excavate, dig, ancient, megafauna and palaeontology.

Embedding Aboriginal and Torres Strait Islander histories and cultures

Students will examine how erosion and weathering can expose and protect fossils of megafauna, as well as artefacts of human activity, providing evidence of interactions between Aboriginal peoples and megafauna.

Lesson answers

1. Students use **Sheet 18 — Fossils: True, false, not sure cards**. Answers are provided on **Answer Sheet 18**.
2. Responses will vary depending on personal experiences but may include words like bones, rocks and dinosaurs.
3.
   a) An animal dies and is buried. Over time layers of sediment build up and press down on the buried remains. Dissolved minerals fill tiny spaces in bone. Over time the sediment is turned into rock and the bones are turned into mineralised fossils.
   b) Responses will vary. A sample answer includes: millions of years.
   c) Fossils are different to rocks because they were once living things.
   d) Responses will vary. Where the dinosaurs and other fossils were formed it would probably have been very muddy with lots of loose sediment.
4. No answer required
5. Responses will vary but may include:
   - layers of rocks built up over years
   - fossils can be found at different levels
   - the level that fossils are found at, and the rock which surrounds them, helps us work out their age
   - fossils are exposed through the weathering and erosion of the rock above them. Before this they were also protected by these rocks.
6. No answer required

7. Answers will vary but may include reference to: safe use of equipment, selection of appropriate equipment so as not to destroy the fossils, fossils are found at different layers, fossils need to be preserved when removed from the ground, plaster is used to remove fossils from the ground and to protect them, it is important to record where exactly the fossil was found.
8.
   a) The mammals/bones look similar but the scale/size is different.
9.
   a) Responses will vary but may include: There is evidence of Indigenous Australian peoples and megafauna living side-by-side. Some scientists believe that Indigenous Australian peoples killed and ate the animals that were trapped in the edges of lakes. It is suggested that Aboriginal peoples and megafauna may have co-existed for up to 15 000 years.
10. Knowing about rocks would help us work out how old the fossils are. Knowledge of the rock cycle and how different rocks are formed through weathering and erosion gives the rocks that the fossils are embedded in an age. This then gives an age to the fossils or any other artefacts which are discovered.
11. No answer required

Lesson 20: Reviewing and evaluating the unit

Lesson concepts

- Earth's surface changes over time due to natural processes
- Ideas can be communicated

Learning alerts

Students will be exposed to terms such as: review and evaluate.

In this lesson students will evaluate how they feel and what they learned in the unit 'Here today, gone tomorrow'.

Lesson answers

1. Responses will vary depending on personal experiences and preferences.
2. Students complete the Send-in task on **Sheet 19 — Unit evaluation**. No answers are provided.

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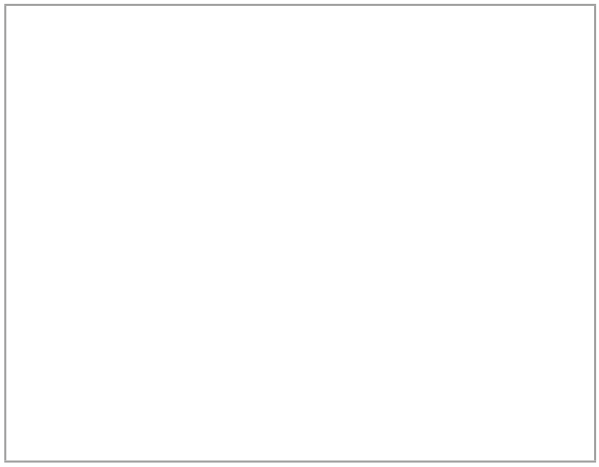
Answer Sheet 01

Geology dig record

Date:

Name:



Tray before excavation

Photograph, draw or write a description of contents.

Place photographs or drawings of the items in situ and once removed in this section — don't forget to add measurements.

Students need to include a description about each item, including the size and colour.

List the items you have found:

Answers will vary.

What techniques did you use to excavate the items? Describe them.

I lightly brushed the soil away with a paint brush, then I used the toothbrush to get between the cracks. I then lifted the object out with the spade. Finally I cleaned it with water.

Answer Sheet 01

Geology dig record sheet

Answers will vary. Sample answers provided as examples.

What type of soil, dirt or rock did you have? Describe it:

I had wet sand. The sand was tan in colour and very fine when dry. It started out being wet, so at first it was clumped together.

Was the excavation easy or difficult? Easy

Were you able to complete the dig? ☑ YES ☐ NO

Explain why or why not:

The soft sand was easy to move as it was so fine. It became easier as it dried. Sometimes I was able to blow it away

Is there any evidence of human activity? ☑ YES ☐ NO

What items show this evidence?

I found a spoon buried in the sand.

Please describe anything interesting or unusual you found during your dig.

I also found some rocks, that were small, round and smooth.

Thank you for participating — your help has been great!

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Answer Sheet 02

Rocks: True, false, not sure cards

Cut out these cards and place them on your 'True, false, not sure' chart.

The correct terms that scientists use to classify rocks are: sedimentary, metamorphic and igneous.

True

The terms rock, stone and pebble are scientific terms used to classify rocks.

False

All rocks are the same and it is hard to tell how they originated.

False

Rocks must always be heavy.

False

Humans can make rocks.

False

Humans cannot make rocks. Rocks and minerals are naturally occurring substances.

True

Rocks and minerals are the same thing.

False

Rocks are not always heavy. Pumice, a volcanic rock, is light-weight and can float.

True

Rocks can be grouped on the basis of their origin and structure.

True

Rocks and minerals are not the same thing; rocks are composed of minerals which are naturally existing substances.

True

Rock hounds

Answers will vary depending on the rocks chosen.

Rock drawing	What colours are present?	Shiny particles Y/N	Coloured bands Y/N	Texture — Holes or bubbles Y/N	Crumbly or flaky Y/N	Name and type of rock if known
1.	grey, pink, black	yes	no	no	no	granite igneous
2.	grey	yes	no	yes	yes	pumice
3.	grey	no	no	yes	yes	sandstone
4.	grey	yes	no	no	no	marble
5.	black and white	yes	yes	no	no	gneiss

Can you group any of the rocks you collected into groups using the observable characteristics? Write the rock numbers that form the group(s).

Yes. Rocks 1, 2, 4 and 5 have shiny particles. Rocks 2 and 3 are crumbly. Rocks 1 and 4 have the same observable characteristics

Answer Sheet 09

Weathering and erosion: True, false, not sure cards

Cut out these cards and place them on your 'True, false, not sure' chart.

Rocks cannot and do not change.

False

Rocks are able to change both their physical and chemical characteristics through the process of weathering.

True

Weathering and erosion are the same thing.

False

Geological processes mainly happen quickly.

False

Weathering involves the process by which rocks exposed to the weather undergo changes in characteristics and break down. Erosion, in contrast, is the movement of weathered material from one place to another.

True

Geological processes can happen over short and long periods of time.

True

Weathering and erosion are only dependent on human involvement.

False

Weathering and erosion are natural processes that can be affected by human activity.

True

All erosion is bad.

False

Some erosion can be good for the land (for example, the Nile delta was created by the deposition of eroded sediments that moved down river and created these fertile lands).

True

Answer Sheet 14

Case study: Uluru

Video clip — What is the main agent of erosion that was identified in the video?

Rain and moving water

Slideshow — What is the main cause of erosion shown in the slides?

Water and wind

Slideshow — What other agents could cause erosion at Uluru?

Human activity, animal activity, changes in temperature

Slide 4 — How could the rocks have moved out of the cave?

Answers will vary. A sample answer might be — weathering broke the rock into smaller pieces and the movement of water, wind or gravity washed the rocks out of the cave.

Slide 5 — How could wind contribute to making a cave like this form?

Answers will vary. A sample answer might be — The wind could pick up small grains of weathered rock and move them over the surface causing more weathering of the softer rock. The wind could then remove the particles from the area. Over time, the cave would be formed.

Slide 6 — The black marks on Uluru are black algae. How could algae growing on the rock make erosion worse?

Answers will vary. A sample answer might be — As the algae grows, it could break down the surface of the rock by chemical weathering. Algae might increase erosion by making the surface of the rock more slippery so that water flows faster across it.

Slide 10 — What has caused the erosion on the surface of the rock?

Answers will vary. A sample answer might be — Human climbers following the path over the surface of the rock have caused erosion.

Answer Sheet 17

Erosion investigation planner

Part A

What are you going to investigate?

What happens to the height of a sandcastle when the amount of water poured over it is changed?

Aim of the investigation

To test the effect of water on erosion.

Sandcastle 1 — 1 L water

I think

the sandcastle will fall apart a bit at the edges when I pour on 1 L of water

because

the water will push on the loose sand and not be strong enough to move the packed sand in the middle

Sandcastle 2 — 2 L water

I think

the sandcastle will have bigger cracks and more of the sand will fall apart and be washed away

because

there is more water and it will create more erosion

Sandcastle 3 — 3 L water

I think

there will not be much left of the sandcastle and most of the sand will spread out on the tray like on a beach

because

there is much more water and the forces of the water will destroy the sandcastle and it will spread out because of running water.

Answer Sheet 17

Record any observations. This might include some drawings or notes on what you see, what happens to the water or what happens to the sand/soil.

Answers will vary. Students may draw a labelled diagram or write notes such as:

- The sandcastle collapsed completely.
- The water was not poured directly on top of sandcastle 2, so it received only part of the water.
- The water 'dug' a single channel in the side of sandcastle 1.

Record the measurements from the sandcastles in the following table.

	Height		Width	
	Before	**After**	**Before**	**After**
Sandcastle 1 (1 L of water)	20 cm	15 cm	25 cm	26 cm
Sandcastle 2 (2 L of water)	20 cm	10 cm	25 cm	29 cm
Sandcastle 3 (3 L of water)	21 cm	5 cm	25 cm	23 cm

The next section of this investigation is to be completed in the following lesson. Please keep this sheet and have it ready for the next lesson.

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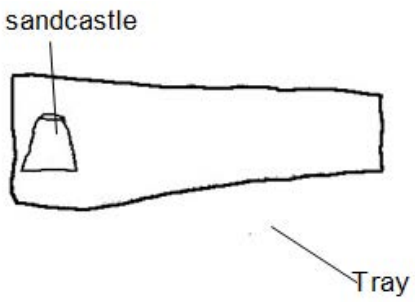
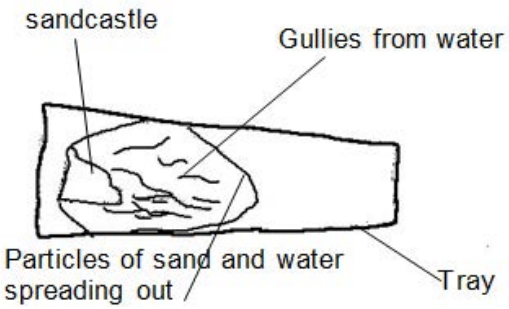
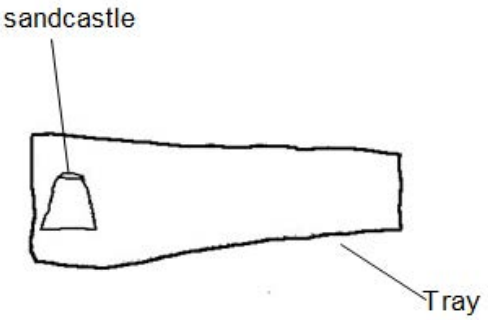
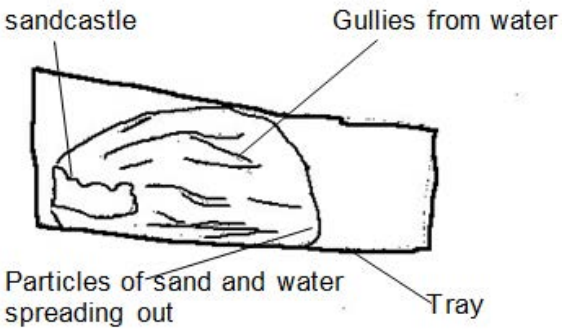
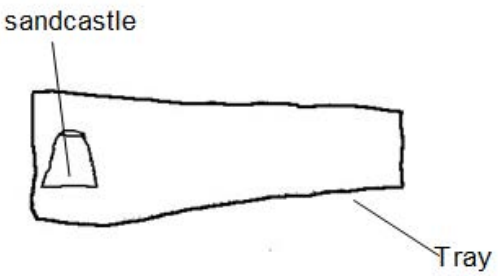
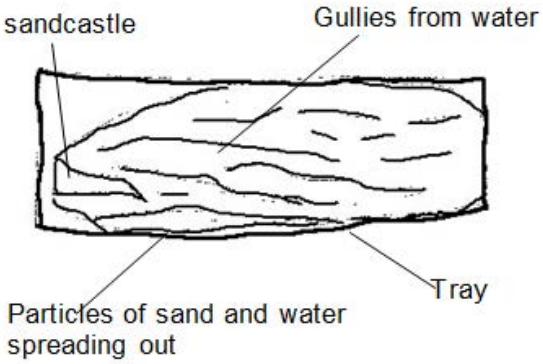
Part B

Results

Use this space to draw annotated diagrams based on your observations.

	Before	After
Sandcastle 1		
Sandcastle 2		
Sandcastle 3		

Answer Sheet 17

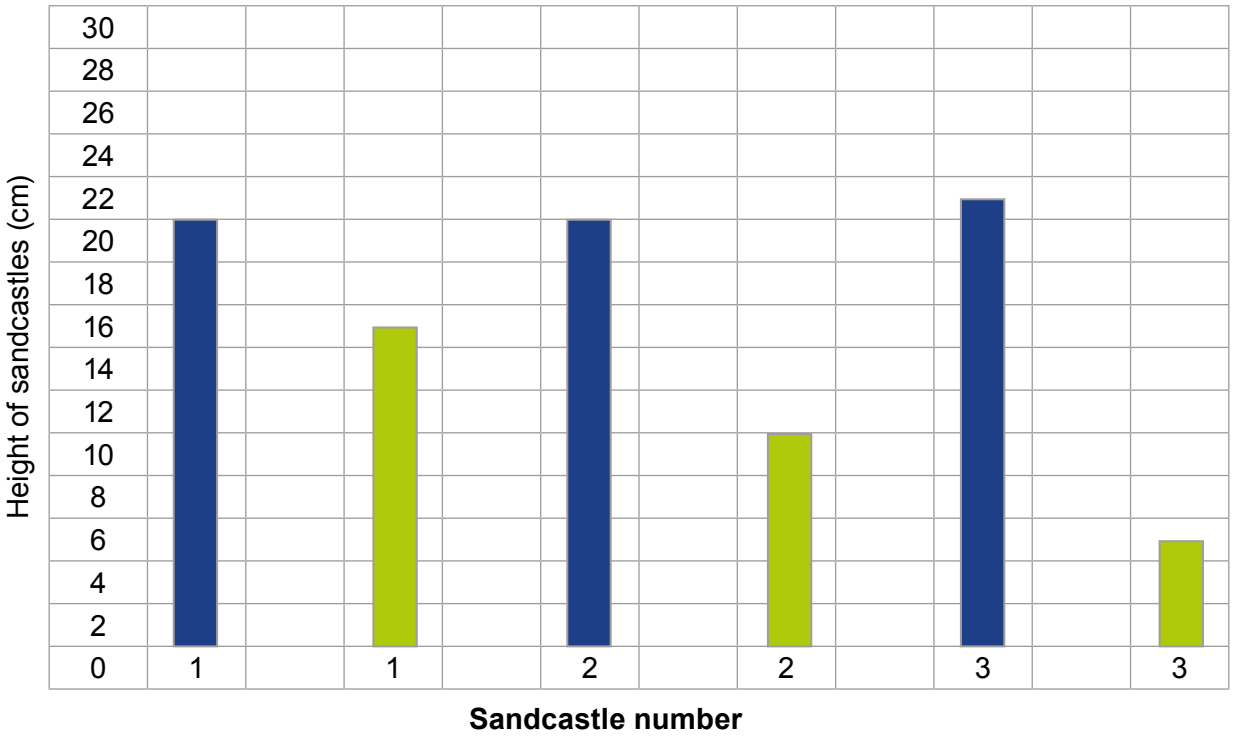
Show your results as column graphs.

Key:

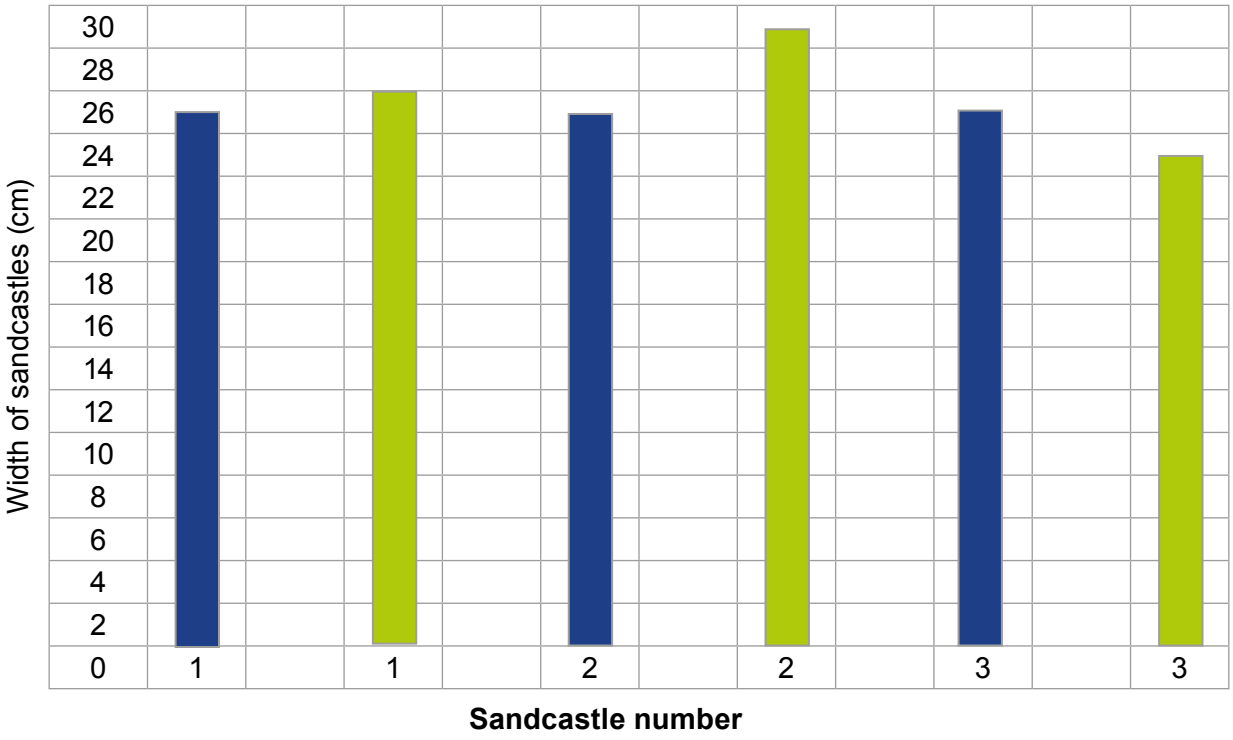
Before —

After —

Height of sandcastles before and after water



Width of sandcastles before and after water



Answer Sheet 17

Discussion

What happened in your investigation?

The height of each of the sandcastle became smaller when more water was poured on them. For example the 1st sandcastle has 1 Litre and it shrunk by 5 cm. The second on had 2 L of water it shrink by 10 cm. The width of the most sandcastles actually got bigger. The last one was smaller but not by much, only 2 cm.

The more water that was poured on the smoother the sand became. The sand spread out in the tray and it had little ruts where the water was running. The sand in the middle of the sandcastle seemed to be pushed aside first.

Explain why you got these results.

I think that the more sand there is the stronger the force of erosion. This is why the height of the castles shrunk by more with the more water used. The width of the sandcastles may be wider after the water has been poured because the sand was not washed away but the sandcastle was broken down. The width of the third castle may have shrunk because the some of the sand was washed away.

The sand was smooth because the water moved away all the loose particles. The sand spread out in the tray because it was all being washed away with the water so it collected where the water stopped and the water spread out in the tray. The sand in the middle was pushed aside first because this is where the water landed.

Do your results match your prediction? Yes ☑ No ☐

Explain any differences between your prediction and your results.

Explain any differences between your prediction and your results.

There were some differences. I though the sand would all wash away on the third attempt but it did not. Some was still sitting there and the castle was nearly as wide after the sand was poured. Also I thought that the sand in the middle would not move first but because this is where I poured the water this is where the first crack appeared.

What worked well in your experiment setup? What was difficult or caused a problem?

The sandcastle showed how water can erode sand very well. With the more water poured there was more erosion each time. It also showed how small particles move with the water. The measuring of the height and width were easier than I thought.

It was a bit hard to make sure that the sandcastles were the same size and because it was windy it was hard to keep them standing before the wind blew them away.

How could you make this investigation fairer? How could you improve this investigation?

I could make sure that I drop the water from the same height each time. I could also make sure I cleaned out the tray each time because this made it hard to observe the results. I could try doing it on a day when it wasn't windy or do it away from the wind.

Answer Sheet 18

Fossils: True, false, not sure cards

Cut out these cards and place them on your 'True, false, not sure' chart.

Fossils are actual pieces of dead animals and plants.

False

Fossils are the preserved remains of an organism. Minerals generally replace the organic matter in bones, teeth and shells. Sometimes the fossil is a mould, as all the soft tissue has disappeared.

True

All fossilised bone is from dinosaurs.

False

Not all fossilised bones come from dinosaurs. Bones can be from animals, including fish and mammals, and from different eras of geological time.

True

Name:

Year 4 Unit 1 — Evidence of learning

Exploring geological processes: Lessons 1–4

Content descriptions:

Science understanding

Earth and space sciences

- Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)

Science as a Human Endeavour

Nature and development of science

- Science involves making predictions and describing patterns and relationships (ACSHE061)

Science Inquiry Skills

Planning and conducting

- Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS066)

Processing and analysing data and information

- Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends. (ACSIS068)

Communicating

- Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS071)

Can the student:	No assistance required	Some assistance	A lot of assistance	Not able to do this task
discuss the effect that characteristics of soils and rocks may have on weathering and erosion processes? (L1)	☐	☐	☐	☐
justify the tools and techniques they used? (L1)	☐	☐	☐	☐
classify the rocks based on observable characteristics? (L2)	☐	☐	☐	☐
describe the characteristics of different soils examined? (L3–4)	☐	☐	☐	☐
Does your student require extra assistance from the teacher? Comment if necessary:				

Exploring weathering: Lessons 5–7

Content descriptions:

Science understanding

Earth and space sciences

- Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)

Science Inquiry Skills

Questioning and Predicting

- With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (ACSIS064)

Planning and conducting

- Suggest ways to plan and conduct investigations to find answers to questions (ACSIS065)
- Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS066)

Communicating

- Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS071)

Can the student:	No assistance required	Some assistance	A lot of assistance	Not able to do this task
identify different causes and types of weathering? (L5)	☐	☐	☐	☐
explain how the models show physical weathering? (L6–7)	☐	☐	☐	☐
Does your student require extra assistance from the teacher? Comment if necessary:				

Exploring erosion: Lessons 8–13

Content descriptions:

Science understanding

Earth and space sciences

- Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)

Science as a Human Endeavour

Nature and development of science

- Science involves making predictions and describing patterns and relationships (ACSHE061)

Use and influence of science

- Science knowledge helps people understand the effect of their actions (ACSHE062)

Science Inquiry Skills

Questioning and predicting

- With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (ACSIS064)

Planning and conducting

- Suggest ways to plan and conduct investigations to find answers to questions (ACSIS065)
- Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS066)

Processing and analysing data and information

- Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends (ACSIS068)
- Compare results with predictions, suggesting possible reasons for findings (ACSIS216)

Evaluating

- Reflect on the investigation; including whether a test was fair or not (ACSIS069)

Communicating

- Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS071)

Can the student:	No assistance required	Some assistance	A lot of assistance	Not able to do this task
describe causes and effects of erosion? (L8–9)	☐	☐	☐	☐
describe appropriate solutions to control erosion? (L8–9)	☐	☐	☐	☐
describe how human activity has impacted on Uluru? (L10)	☐	☐	☐	☐
suggest solutions to reduce or stop erosion caused by human activity at Uluru? (L10)	☐	☐	☐	☐
describe an evidence based cause and effect relationship of water erosion? (L11–12)	☐	☐	☐	☐
describe the effect various natural disasters have on the surface of the Earth? (L13)	☐	☐	☐	☐
Does your student require extra assistance from the teacher? Comment if necessary:				

Reviewing and assessment: Lessons 14–18

Content descriptions:

Science understanding

Earth and space sciences

- Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)

Science as a Human Endeavour

Nature and development of science

- Science involves making predictions and describing patterns and relationships (ACSHE061)

Use and influence of science

- Science knowledge helps people understand the effect of their actions (ACSHE062)

Science Inquiry Skills

Questioning and predicting

- With guidance identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (ACSIS064)

Planning and conducting

- Suggest ways to plan and conduct investigations to find answers to questions (ACSIS065)
- Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS066)

Processing and analysing data and information

- Compare results with predictions, suggesting possible reasons for findings (ACSIS216)

Communicating

- Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS071)

Reviewing and evaluating: Lessons 19–20

Content descriptions:

Science understanding

Earth and space sciences

- Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)

Science Inquiry Skills

Planning and conducting

- Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS066)

Communicating

- Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS071)

Can the student:	No assistance required	Some assistance	A lot of assistance	Not able to do this task
describe how fossils are found, excavated and preserved? (L19)	☐	☐	☐	☐
describe lessons that are successful or challenging within the unit? (L20)	☐	☐	☐	☐
suggest areas for improvement within the unit? (L20)	☐	☐	☐	☐
Does your student require extra assistance from the teacher? Comment if necessary:				

For the teacher

	Returned	Date	How returned
Sheet 7 — Soil observations (L3)	☐		
Sheet 12 — Erosion in my environment (L8–9)	☐		
Sheet 13 — Annotated diagram of erosion solution (L9)	☐		
Sheet 15 — Email template (L10)	☐		
Assessment booklet — Soil erosion investigation (L15–18)	☐		
Sheet 19 — Unit evaluation (L20)	☐		