



The DeadlyScience Guide to Glass

Teacher Guide

Foundation - Year 6



Acknowledgement of Country

DeadlyScience and Australia Post pay respect to the Traditional Custodians of the land, to all Elders past and present, and to First Nations people everywhere. First Nations people have used science for over 65,000 years, making their culture the oldest in the world. The first scientists passed on the lessons of the land, sea and sky, to the future scientists of today through stories, song and dance. We call this caring for Country. If you care for Country, the Country will care for you.



Yaama!

My name is Corey Tutt OAM. I am a proud Kamilaroi man, and the CEO and founder of DeadlyScience.

In 2018, while working as a research assistant for the University of Sydney, I founded DeadlyScience, a not-for-profit organisation that aims to provide science books and equipment to remote schools in Australia, and connects young Indigenous people with mentors to encourage their participation in STEM.

In partnership with Australia Post, we have developed this curriculum-aligned Teacher Guide, which aims to bring First Nations science into your classroom. It's based on the Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces and features the deadly designs of Mim Cole, a Larrakia, Wardaman and Karajarri visual artist from Darwin, in the Northern Territory.

For more information about DeadlyScience, check us out at www.deadlyscience.org.au, or show us your experiments in action on social media by tagging us @deadlyscience.

Yaalu

Corey

About this guide

First Nations people around Australia have practised and continue to develop amazing science. They are the first scientists of Australia. The lessons in this guide are designed to spark thinking and encourage children to learn more about First Nations people and their connection to science. The lessons are designed to inspire students to discover science and become innovative scientists themselves, encouraging them to consider future pathways in science.

It is anticipated classes will build connections with local First Nations communities and learn about the connections between traditional Aboriginal and Torres Strait Islander science and science of the modern world. Connect with local Aboriginal and Torres Strait Islander people and organisations who can help your class develop a deeper understanding of First Nations science by enquiring at your Local Land Council or cultural centre. Teachers can even contact DeadlyScience and see whether they can arrange a DeadlyLearner session.



Teacher notes

Use a map, such as the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Map of Indigenous Australia, to teach students about the Traditional Owners of the land on which they live, learn and play. Explain there are over 500 distinct First Nations cultural and language groups across Australia.

Introduce students to the concept of a ‘yarning circle’, which is a term used in many First Nations communities. Use a yarning circle mat or any outdoor yarning circle to increase students’ knowledge of First Nations ways of learning.

Begin each lesson with an Acknowledgement of Country to respectfully recognise the traditional custodians of the land, sea, waterways and sky of your area. Discuss the meaning an Acknowledgement of Country provides as an opportunity to introduce the themes of the lessons, including custodianship, respect and connection to Country.

Lesson Overview | Introduction

The DeadlyScience Guide to Glass is a hands-on, practical resource for teachers of Foundation to Year 6 students. In support of the 2022 National Science Week theme of Glass, it introduces a basic understanding of the history and importance of glass evolution and use over time, from a First Nations perspective.

Developed in partnership with Australia Post and DeadlyScience, this guide is curriculum-aligned and strongly features the cross-curriculum priority of Aboriginal and Torres Strait Islander histories and cultures. Each lesson reflects on our nation's first scientists' use of natural glass.

The guide can be used alone, but is best supported by the [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#).

Year group	Lesson overview	Curriculum links		Page
		Science	Aboriginal and Torres Strait Islander Histories and Cultures	
Foundation - Year 2	Tinkering with tools Introduce the idea that tools can be created using stone and glass	AC9SFU03 AC9S1H01 AC9S2U03	OI.2 OI.5	7
Year 3 - Year 4	The changing face of glass Explore the differences between how glass is manufactured vs. the natural process of glass formation	AC9S3U02 AC9S4U04	OI.2 OI.5	10
Year 5 - Year 6	The glass impact Understand how the use of rocks and glass as tools has changed over time	AC9S5U04 AC9S6U04	OI.2 OI.5	13



Glass | More than meets the eye

What is glass?

Glass is one of the most commonly used materials in our world. It has a unique structure that we call an amorphous solid, which means that all of its particles are randomly mixed together. Although glass is hard and strong, its composition makes it brittle which means it can shatter very easily. It can be transparent or coloured, and usually has a smooth surface.

Glass is made from natural materials such as sand, soda ash and limestone. These raw materials are heated at very high temperatures which then reform into liquid. This liquid (glass) can be poured, blown, pressed and moulded into objects. When the liquid cools it becomes solid and the glass object sets.

Why the 'Glass' theme?

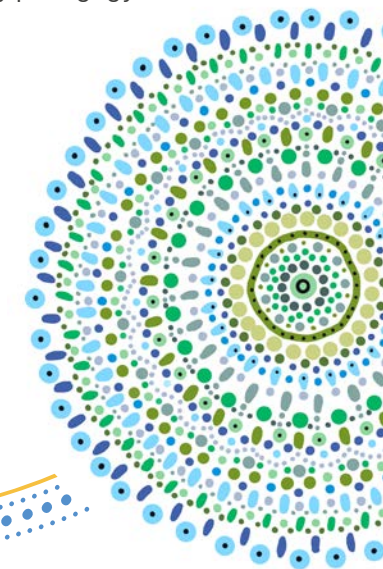
Each year the United Nations (UN) dedicates an entire calendar year to a particular topic or theme. The purpose is to raise awareness of how the topic is important to life, society and progression. The UN has described glass as one of the most important, versatile and transformative materials in history. They claim it will continue to have an enormous impact into our future, not only for its many applications, but also for the integral role it will play in sustainable development.¹

How is it relevant to my students?

This guide is designed to provide all Australian students with fun and engaging scientific inquiry opportunities, and an insight into the important contributions of our nation's first scientists.²

Does it link to the curriculum?

Yes! The following guide includes three lessons linked to the Australian Curriculum. Each lesson provides learning intentions, guiding questions and vocabulary lists, and is underpinned by the Blooms Taxonomy pedagogy.



Australia's First Scientists | Indigenous perspectives

Aboriginal and Torres Strait Islander people have a highly sophisticated and varied understanding of tool usage and purpose. Chisels, knives, saws, spearheads and axes for example are made from volcanic greenstone and natural glass, such as obsidian and tektites. These tools are created through a process known as knapping, which involves hitting the rock with a 'hammerstone'. This process produces a sharp piece of stone called a flake. Expertly crafted stone tools are an important part of day-to-day life and culture in some communities and continue to be a valuable commodity.³

Earth's connection

The natural materials used to make glass are found abundantly on earth and fall into three categories:

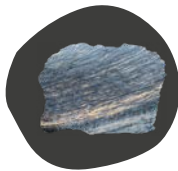
Metamorphic

Formed from other rocks that are changed by heat and pressure underground



Igneous

Formed from melted rock deep inside the earth



Sedimentary

Formed from layers of sand, silt, dead plants, and animal skeletons



Safety note

Use discretion when providing rocks and materials for use in the classroom. Teacher supervision should be applied at all times.

Science checklist

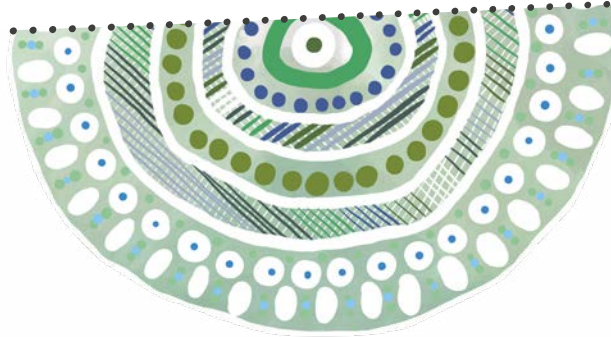
When creating highly efficient stone tools, Aboriginal and Torres Strait Islander people draw upon their deep knowledge of:

- **Geological science**
Location, composition and qualities of different types of rocks and stones
- **Physical science**
Development and utilisation of effective stone knapping techniques
- **Biological science**
How tools need to be engineered to suit their specific purpose in hunting, skinning, harvesting, peeling and surgical procedures
- **Chemical science**
Treatment of certain types of rocks to transform their physicochemical properties for technical purposes



FOUNDATION - YEAR 2

Tinkering with tools



Foundation - Year 2 | Tinkering with tools



Lesson overview

This lesson introduces students to the concept of creating tools using stone and glass. They will investigate and classify different types of rocks used by Aboriginal and Torres Strait Islander people, then apply this knowledge to an experiment on the effectiveness of different materials for conducting daily tasks. Using creative materials, students will then use these learnings to design their own tools.

Learning intention

In this lesson, students will:

- Learn about the varied use of rocks in Aboriginal and Torres Strait Islander cultures
- Describe and compare rocks
- Understand different rocks have different functions
- Design an original tool using creative materials

Guiding questions

Comprehend

How would you classify the following rocks?

Analyse

How would you imagine these rocks to be used as tools?

Synthesise

How have you designed your tool to perform the necessary functions?

Resources

- Internet access for students
- Magnifying glasses
- A collection of rocks and smooth glass (students may bring their own from home)
- A4 paper for creating classifying labels
- A4 paper for performing cutting task
- Carrots
- Creative materials such as cardboard, tape, plastic lids and container

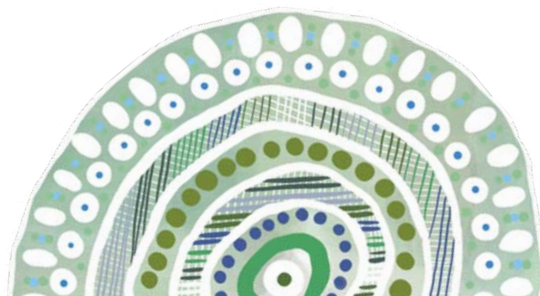
Vocabulary

Core: Aboriginal person, Torres Strait Islander person, hunt, cook, tool, stone, glass, grind, liquid, solid, rock

Extension: knap, amorphous, metamorphic, igneous, sedimentary

Extend the learning

Learn more about the inside of the earth and its structure on pages 2-3 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)



Foundation - Year 2 | Tinkering with tools



Step 1: Explore

Watch / Listen / Read - **Learn**

- As a class, observe and discuss the students' rock collections
- Briefly explain that there are three classifications of rock, and discuss the differences between each (metamorphic, igneous and sedimentary)
- If available, refer to page 12 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#). Explain that some rocks are 'cooked' under the Earth's surface. Discuss other items that change when they are heated
- Place rocks in a large space and allow students to sort and classify them. Examples include: size, colour, texture, shape, hardness
- Pose the guiding question:



How would you classify the following rocks?

Step 2: Analyse

Solve a problem - **Think**

- Each student selects a rock to observe. Using a magnifying glass they examine the composition of their rock. Can they see crystals? How many different colours can they see? Are there grooves in the rock? Do they see any parts that look like glass?
- Encourage students to talk to their peers about what they see and draw a diagram, labelling if able
- Explain to students that Aboriginal and Torres Strait Islander people used stones, rocks and natural glass to create tools to help them perform everyday tasks. Stone tools were used for hunting, food preparation and to make clothing
- Pose the guiding question:



How would you imagine these rocks to be used as tools?

- Show students images of stone tools, including natural glass made from obsidian or spinifex resin. Encourage discussion about how these tools may have been engineered by Aboriginal and Torres Strait Islander people

Step 3: Create

Try something new - **Do**

- Students select a different rock and perform a series of everyday tasks using this as the tool in replacement of the modern day aide. For example: cutting a piece of paper, peeling a carrot, drawing a picture etc.
- Students share their successes and challenges.
- Reveal that Aboriginal and Torres Strait Islander people would use a process known as 'knapping' to shape rocks, stones and natural glass into functional tools
- Using creative materials, students create their own tool to perform a task. Tools make our lives easier, so how can we ensure the tools we make help us?
- Consider how tools can be modified to assist people with a disability, such as a hook to open a heavy glass door or a spoon that rests on a bowl to prevent spills
- Pose the guiding question:

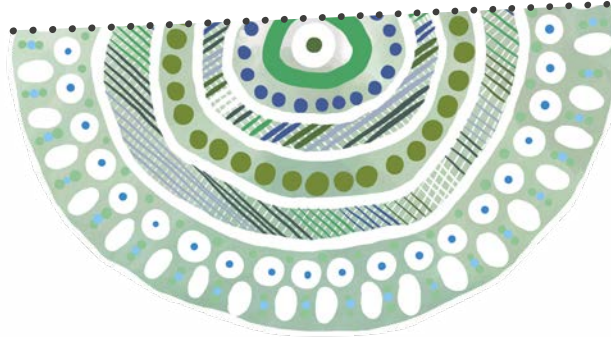


How have you designed your tool to perform the necessary functions?

- Support students through the process using a design thinking approach

YEAR 3 - YEAR 4

The changing face of glass



Year 3 - Year 4 | The changing face of glass



Lesson overview

In this lesson, students will learn about metamorphic, igneous and sedimentary rocks and replicate the formation of these rocks using crayons. They will compare how glass is manufactured by humans versus how it forms naturally, and explore tools made using natural glass sources such as obsidian or spinifex resin. Students will explore if decoration affects performance, then create their own decorative but functional 'glass' objects, inspired by modern Aboriginal and Torres Strait Islander decorative tools.

Learning intention

In this lesson, students will:

- Describe the differences between metamorphic, igneous and sedimentary rocks
- Replicate the formation of rocks using creative materials
- Describe the difference between manufactured versus natural glass sources
- Design a decorative 'glass' tool
- Understand how First Nations people used different materials to create tools

Guiding questions

Comprehend

What are the different ways that rocks are formed?

Analyse

Why did First Nations people find glass such a useful material for tools?

Synthesise

How could you design a beautiful, yet functional, glass tool?

Resources

- Internet access for students
- Crayons in four different colours
- Pencil sharpener
- Four containers for holding crayon shavings
- Aluminium foil
- Four disposable wooden stirrers
- Mug
- Boiling water
- Student notebooks for brainstorming
- Coloured cellophane, cardboard, tape, glue for tool making

Safety note

Keep your students safe. Water should be boiled and handled by a responsible adult.

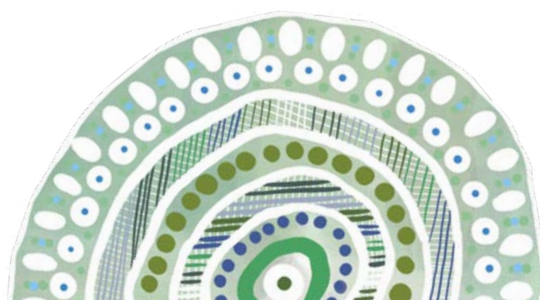
Vocabulary

Core: First Nations, glass, metamorphic, igneous, sedimentary, natural

Extension: Bifacial, manufactured, tektites, fulgurites, spinifex resin

Extend the learning

- Learn more about earth's rocks and their structure on pages 6-15 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)
- Find the names of some tools found in the local area
- Find some tools at the local museum or contact the Local Land Council.



Year 3 - Year 4 | The changing face of glass



Step 1: Explore

Watch / Listen / Read - **Learn**

- Briefly explain there are three classifications of rock, and discuss the differences between each (metamorphic, igneous and sedimentary)
- If available, refer to page 12 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)
- Students replicate the formation of rocks using the [crayon investigation](#)⁴
- Pose the guiding question:

What are the different ways rocks are formed?

- Obsidian (produced from the intense heat of volcanoes) is a type of natural igneous glass used by First Nations people to create tools. Provide images of stone tools for students to view
- Manufactured glass cannot be found in nature. Discuss students' thoughts on how glass might be made
- Watch a video describing the process of creating glass

Step 2: Analyse

Solve a problem - **Think**

- Students brainstorm all of the items they use in a day that contain glass. Examples include: drinking glass, car windscreen, mirror, classroom window, phone. Discuss the different sizes, shapes and functions
- Pose the guiding question:

Why did First Nations people find glass such a useful material for tools?

- Discuss the constantly evolving nature of glass and explain to students that after colonisation, manufactured glass began to be used by First Nations people
- They continued to make bifacial (sharp on both sides) tools and weapons and traded them with Europeans for provisions
- Students research other specimens of glass produced by nature such as
 - Tektites (result of a meteorite impact)
 - Fulgurites (caused by lightning on sand)
 - Spinifex resin (from a plant)

Step 3: Create

Try something new - **Do**

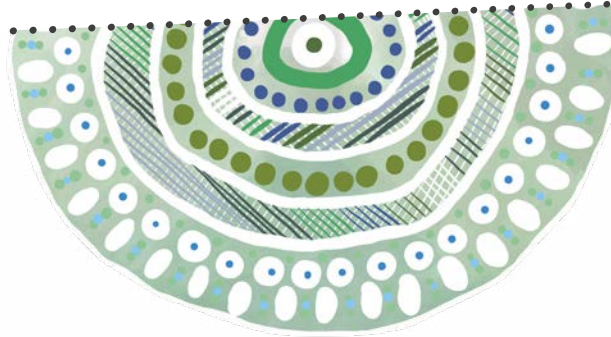
- Display the [image](#)⁵ of glass Kimberley points to compare and contrast with [images](#)⁶ of stone tools
- Ask students to select a tool fit for different purposes, noting whether they choose the more decorative option
- Explain these modern tools are functional as well as decorative, but often the decoration does not improve the function
- Using provided materials, students will create their own functional and decorative tool
- Consider its purpose; how does this tool help to make life easier? Examples include: optical glasses for young children, computer screen for people with colour-blindness, glass touchpad to turn on taps for people with hand weaknesses
- Pose the guiding question:

How could you design a beautiful, yet functional, glass tool?

- Support students through the process using a design thinking approach

YEAR 5 - YEAR 6

The glass impact



Year 5 - Year 6 | The glass impact



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Lesson overview

This lesson investigates the important role that glass has in human society. Students will begin by exploring different types of rocks and conduct a baseline scratch test to investigate rock hardness. They will discuss why particular rocks are suited for different uses, focusing on the rocks at the harder end of the scale. Students will investigate how obsidian glass has been used for centuries by Indigenous Australians, and is now being used for sophisticated modern day tools.

Learning intention

In this lesson, students will:

- Investigate rock hardness
- Conduct a scratch test on a selection of rocks
- Analyse the properties of glass
- Innovate on current tool designs
- Understand traditional uses for soft and hard rocks (and glass) by Indigenous Australians

Guiding questions

Comprehend

How many ways are rocks used in your everyday life?

Analyse

Which rock is the hardest, based on your investigations?

What functions could this rock perform in everyday life? What did Indigenous Australians do with this rock?

Synthesise

How could glass be used to innovate upon the design of a chosen tool?

Resources

- Internet access for students
- A collection of rocks, smooth glass and if possible, a sample of obsidian (students may bring their own from home)
- A metal nail or similar tool used to scratch test rocks
- Paper and writing implements, or computer design software to create prototypes

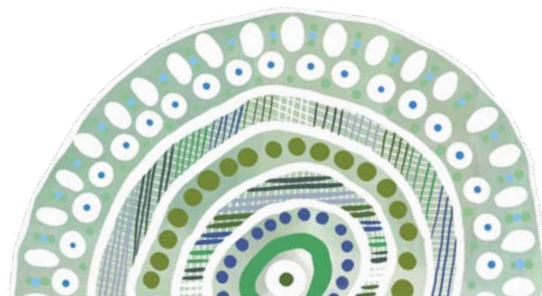
Vocabulary

Core: Indigenous Australians, glass, natural, baseline, tool, hardest, softest, mineral

Extension: Metamorphic, igneous, sedimentary, obsidian, innovate, properties, prototype

Extend the learning

- Learn more about obsidian producing volcanoes on Pages 18-19 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)
- Visit a local land council or museum to see tools used by Indigenous Australians



Year 5 - Year 6 | The glass impact



Step 1: Explore

Watch / Listen / Read - **Learn**


- Briefly explain that there are three classifications of rock, and discuss the differences between each (metamorphic, igneous and sedimentary)
- If available, refer to page 12 of [Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)
- Have a collection of rocks and smooth glass of varied hardness on display for the class. Try to obtain a sample of obsidian if possible
- Ask students to scratch test the rock samples using a metal tool (such as a nail). Rank these on a scale from softest (the easiest to scratch) to hardest (the most resistant)
- Pose the following question:



Which rock is the hardest, based on your investigations?
What functions could this rock perform in everyday life?
What did Indigneous Australians do with this rock?


Step 2: Analyse

Solve a problem - **Think**

- Explore traditional uses for soft and hard rocks (and glass) by Indigneous Australians. Are there any that are similar to those commonly used in Australian society today?
- Pose the question:
 **How many ways are rocks used in your everyday life?**
- After brainstorming the uses for rocks, identify tools and everyday objects that are created using rocks and minerals, including glass e.g. a diamond tip drill, obsidian scalpel, quartz watches, flint fire starters, silver in electronics, fibre optic cables etc.
- Rank these materials in order from softest to hardest, identifying any similarities and differences
- Students select one of the tools and research the properties of the material used to perform the function. They must identify the strengths and weaknesses for using that material, and any alternatives available

Step 3: Create

Try something new - **Do**

- Explore the properties of manufactured glass versus obsidian glass. What are the strength differences and how are they used for different purposes?
- Pose the question:
 **How could you innovate upon a tool design using glass?**
- After exploring the tools in the previous step, students select one tool that does not use glass as its primary material, and create a product redesign using obsidian glass instead
- Students need to consider the benefits, challenges and alterations that would need to be made to the product to innovate on the original design
- Plans for a prototype should be drawn up with explanations as to how the use of obsidian will improve the production, use and sustainability of the product
- Students present their prototype redesign to the class

Links and Sources

Resources

[Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces](#)

Footnote 1 - [International Year of Glass Official Website](#)

Footnote 2 - [National Science Week Brochure](#), pg 12

Footnote 3 - [Australian Curriculum Indigenous Perspectives - Science](#)

Footnote 4 - [Crayon Investigation](#)

Footnote 5 - [Glass Kimberley Points](#)

Footnote 6 - [Stone Tool Examples](#)



The DeadlyScience Guide to Glass is designed to support the 2022 National Science Week theme of Glass.

Australia Post and DeadlyScience would like to acknowledge and thank publisher, Australian Geographic for granting permission to feature the content from Australian Geographic DeadlyScience Book 4: Earth's Changing Surfaces within this Teacher Guide.

Australia Post and DeadlyScience would also like to acknowledge and thank Mim Cole for her artworks designed for the Australian Geographic DeadlyScience book series. Mim Cole is a Larrakia, Wardaman and Karajarri visual artist from Darwin, Northern Territory.

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