TEACHER GUIDE

GEOLOGY AROUND YOU

An inquiry-led activity designed to produce one realization: **many ordinary materials, resources and services have important geological connections, even when they no longer look geological.**

CENTRAL QUESTION

How much of everyday life depends on geology?

BEST FOR

Secondary / middle-school Earth science, geography, geology or STEM.

TIMING

Best as two 50-minute lessons. Can be compressed to about 70 minutes by reducing local research.

MATERIALS

Student pack, pens, room/building observations, optional teacher-provided water and energy-source information.

TEACHER ROLE

Do not provide every trace first. Ask students where they think an object came from, press for evidence, then help them improve the chain.

LEARNING GOALS

- Trace familiar materials and resources backward to geological raw materials, deposits, rock, groundwater systems or Earth heat.
- Recognize that manufactured products can have geological raw-material chains even when the final product is not a rock or mineral.
- Explain several distinct ways geology supports buildings, technology, water, energy, petroleum-derived materials and jewellery.
- Use discussion and evidence to revise an initial explanation rather than treating a first guess as final.

THE INTENDED ENDPOINT

Students should leave saying something like: **“I knew rocks were geology. I had not realized the window, wiring, phone, tap water, heating, plastic chair and jewellery all had geological connections too.”**

TEACHING APPROACH

LET STUDENTS BUILD THE CONNECTION

This package works best as a guided conversation with evidence, not as a lecture followed by recall questions.

LOOK -> GUESS -> TRACE BACK -> DISCUSS -> REVISE

THE REPEATED DISCUSSION ROUTINE

1. LOOK

Choose a real object or material in the room. Begin with what students can actually see.

2. GUESS

Ask: “What do you think this is made from?” and “What came before that?” Accept provisional answers.

3. TRACE

Keep moving backward until a geological raw material, deposit, water system, fuel or heat source appears.

4. DISCUSS + REVISE

Compare ideas, add evidence, correct overclaims and let students rewrite their original trace.

QUESTION STEMS THAT KEEP THE THINKING WITH STUDENTS

- What is this object actually made from?
- Where did that material exist before people processed it?
- Was it quarried, mined, pumped, grown or manufactured?
- Which part of the story is geological?
- What evidence supports that claim?
- What are we assuming?
- What would make you change your mind?

DO NOT FRONT-LOAD THE ANSWERS

The reference information in the student pack is there to support discussion, not replace it. Where possible, ask for a first guess before directing students to the relevant information box.

LANGUAGE TO MODEL

Prefer **“has a geological connection”** over “is geology.” The Sun is not geological, wind is not geological, and a plastic bottle is not a rock. The useful question is where geology enters the supply chain.

BACKGROUND 01

FROM NATURAL STONE TO METALS

The sequence deliberately starts with obvious geology, then makes the connection less visible.

NATURAL STONE: GEOLOGY WITH MINIMAL TRANSFORMATION

Material	Geological origin	Common use
Granite	Igneous rock crystallized from molten material.	Countertops, paving, cladding, steps
Limestone	Sedimentary carbonate rock.	Tiles, wall stone, sills; also a major cement raw material
Marble	Metamorphosed carbonate rock, commonly derived from limestone.	Floors, tiles, decorative stone
Slate	Fine-grained metamorphic rock, commonly derived from mudstone/ shale.	Roofing, tiles, paving

Rock families are supporting context only. Use them if they help explain an observed natural stone. Do not turn this stage into a separate rock-cycle lesson.

TRANSFORMED MATERIALS: GEOLOGY AS RAW MATERIAL

Everyday material	Useful geological trace
Glass	Silica-rich sand, commonly quartz-rich, plus other mineral raw materials -> melting/forming -> glass.
Brick	Clay-rich geological material -> shaping/firing -> brick.
Concrete	Sand/gravel aggregate + cement + water. Cement is commonly manufactured from limestone and clay/shale-rich raw materials.
Steel	Iron ore -> iron extraction -> steel. Hematite and magnetite are major iron minerals.
Copper wiring	Copper-bearing ore deposit -> extraction/refining -> copper.
Aluminium	Bauxite ore -> refining/smelting -> aluminium.

IRON CONNECTION

Many major iron resources occur in **banded iron formations (BIFs)**, ancient layered rocks that commonly contain hematite and/or magnetite. BIF is an important iron-ore setting, not the only one.

BACKGROUND 02

WATER: GEOLOGY YOU DRINK

The water section should feel like another tracing problem: “Where did the water in this tap come from, and where does geology matter in that route?”

SURFACE WATER AND GROUNDWATER

Public supplies may use rivers, lakes, reservoirs, groundwater wells or mixtures. Treatment and distribution happen after collection. Use local public information if available, but **unknown** is better than invented certainty.

GROUNDWATER

Water is stored and moves through pores and fractures in soil, sediment and rock. Wells can withdraw it where the geological materials store and transmit useful quantities of water.

SURFACE WATER

Geology shapes catchments, valleys, river channels and reservoir sites, and influences the sediment and dissolved material encountered by water.

IF GROUNDWATER IS PART OF THE TRACE

Groundwater is stored in pores and fractures in soil, sediment and rock. **Porosity** describes how much pore or fracture space is available to hold water, while **permeability** describes how easily water can move through connected spaces. These properties help explain why some sediments and rocks can store and transmit useful quantities of groundwater.

COMMON MISCONCEPTION

Groundwater is usually not a giant underground river. It commonly occupies pores and fractures. Karst systems can contain larger channels, but that is a special geological setting rather than the general model.

DISCUSSION QUESTIONS

- Where was this water collected before it was treated and delivered?
- Where in that route does geology influence the source, storage or landscape?
- What evidence do we actually have about our own water supply?

TEACHING TARGET

The desired realization is simple: **water may look like the least “rock-like” thing in the room, yet geology can strongly influence where it is stored, collected and moved.**

BACKGROUND 03

ENERGY: GEOLOGY BEHIND THE SWITCH

Ask students to distinguish the **energy carrier** they use from the original source. “Electricity” is usually the middle of the chain, not the beginning.

Source	Where geology enters
Coal	Geological fuel formed from ancient plant material transformed during burial over geological time.
Oil / natural gas	Much conventional oil and gas formed from buried organic matter in sedimentary basins and accumulated where suitable source, reservoir and sealing conditions occurred.
Nuclear	Uranium must occur in sufficiently concentrated geological deposits to be mined and processed into fuel.
Geothermal	Uses heat from within Earth; useful systems depend on geological temperature, permeability, fluids and depth.
Wind / solar / hydro	The energy source is not geological. The infrastructure still depends on mined materials such as iron, copper, aluminium, silica and other resources.

THE DISCUSSION MOVE

Ask one pair to trace a fossil-fuel or nuclear example, then another pair to trace a renewable example. The comparison prevents the false conclusion that only fossil fuels are “geological.”

DIRECT GEOLOGICAL SOURCE

Coal, oil, gas, uranium and geothermal heat have a direct geological resource or Earth-heat connection.

MATERIAL DEPENDENCE

Wind, solar and hydro derive energy elsewhere, but their physical systems still require large amounts of mined and processed geological materials.

AVOID THE SLOGAN

Do not teach “all energy is geology.” Teach the more accurate and interesting idea that **geology enters different energy systems in different places.**

BACKGROUND 04

PETROLEUM PRODUCTS & GEOLOGY YOU WEAR

OIL WITHOUT BURNING IT

Crude oil and natural gas can be chemical feedstocks as well as fuels. Refining and petrochemical processing produce molecules used in many manufactured materials.

Material	Connection
Many plastics	Petrochemical feedstocks commonly derived from crude oil or natural gas -> polymers -> manufactured products.
Synthetic fibres	Polyester, nylon and many other synthetic fibres commonly use petrochemical feedstocks.
Synthetic rubber	Many synthetic rubbers use petrochemical feedstocks; natural rubber is plant-derived.
Asphalt / bitumen	Road asphalt commonly combines mineral aggregate with bitumen, a petroleum-derived binder.

Use careful qualifiers. Not every plastic or fibre has the same feedstock. “Many,” “often” and “may” are better than universal claims unless a specific product is documented.

GEOLOGY YOU WEAR

Example	Useful explanation
Amethyst	Purple variety of quartz.
Ruby / sapphire	Gem varieties of corundum.
Diamond	Crystalline carbon formed naturally under particular geological conditions.
Gold / silver	Metals obtained from geological deposits, then refined and usually alloyed for jewellery.
Pearl	Biogenic material, not a mineral.
Glass / cubic zirconia	Manufactured gem materials.

THE USEFUL DISTINCTION

Gemstone is a use/value term. Gem materials can be minerals, rocks, biological materials or manufactured substitutes. The geological question is still: what is the material, where did it come from, and what evidence supports that identification?

RUN THE LESSON

FLOW, DISCUSSION & ASSESSMENT

SUGGESTED TWO-LESSON FLOW

Time	Activity	Teacher move
8 min	Page 1 prediction + room scan	Collect examples without confirming them yet.
12 min	Natural stone	Start with the obvious geological materials.
20 min	Transformed materials + metals	Keep asking “what came before that?”
12 min	Water	Use local information if practical; allow unknown.
15 min	Energy	Separate energy carrier from original source.
12 min	Petroleum products	Challenge the idea that oil matters only as fuel.
10 min	Gems + jewellery	Compare geological, biological and manufactured materials.
10 min	Final audit + reflection	Return to the opening prediction.

WHAT TO ASSESS

TRACE

Can the student follow a plausible chain from everyday object/ service back to a geological connection?

EVIDENCE

Does the student use observation, provided information or a reliable source instead of unsupported certainty?

REVISION

Can the student improve an explanation after discussion or new information?

SYNTHESIS

Can the student explain that geology matters in several different ways, not just as visible rock?

COMMON MISCONCEPTIONS TO CATCH IN DISCUSSION

- Concrete is a sedimentary rock. **No:** it is a manufactured composite.
- Brick is metamorphic rock. **No:** kiln firing is manufacturing.
- Glass is “just sand.” **No:** silica-rich sand is a major raw material, but glass is manufactured and commonly contains additional ingredients.
- Electricity is an original energy source. **Usually no:** it is an energy carrier.
- Renewables have no geological link. **No:** the energy may be non-geological, but equipment requires mined materials.
- All plastics come from oil. **No:** many use oil/gas-derived petrochemical feedstocks; alternatives exist.

BEST FINAL DISCUSSION QUESTION

“Which object in this room seemed least geological at the start, and what geological connection can you now trace?”