

Questions for any rock face 1: weathering

What questions about weathering might be asked at any rock exposure?

The ELI* series of ‘Questions for any rock face’ helps teachers to plan investigative fieldwork at any rock exposure**. In each case some possible questions are given, with some likely answers, to help you to decide whether the questions might work well at your site, or whether they would be asked better elsewhere. Answering the questions will provide basic understanding of the evidence preserved in rocks of the processes that formed them.

Weathering

Weathering is the break up and break down (physical break up and chemical breakdown) of rocks at the Earth’s surface without the removal of solid material (although material can be removed in solution).

Take your pupils to a place where clean or recently broken rock surfaces can be compared with more weathered surfaces – and ask these questions:

Possible questions	Possible answers
Are some rock surfaces more crumbly than others of a similar type?	More exposed surfaces may have looser grains than new or protected ones
What might have caused the rock surface to crumble?	In permeable rocks, chemical effects are most likely to loosen grains, together with freeze/thaw effects where it is cold enough for rock to freeze, or heating/cooling effects where there is a big difference between day and night temperatures
Are some rock surfaces discoloured when compared with others?	Natural discolouration is due to chemical attack
Are lichens or mosses/other plants found on some surfaces?	These are causing biological weathering, with biochemical attack on the rocks and roots prising apart grains and cracks
What is the name of the processes that loosens and discolours rock faces without removing grains?	Weathering
Are the rocks lightly, moderately or heavily weathered?	This question asks pupils to give a feel for the scale of the weathering



Chemical and biological weathering at Apes Tor, Staffordshire Moorlands, UK. (Chris King).



The effects of chemical weathering at the Giant's Causeway, Northern Ireland, UK. (Peter Kennett).

* ELI = Earthlearningidea

** An exposure is where rocks can be seen at the Earth’s surface, exposed by natural or artificial means; anywhere where a rock reaches the surface, even if it is covered by soil, etc. is an outcrop, so an exposure is also part of an outcrop.

The back up

Title: Questions for any rock face 1: weathering

Subtitle: What questions about weathering might be asked at any rock exposure?

Topic: Helping teachers to ask suitable investigative questions about weathering at rock exposures.

Age range of pupils: 9-16 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- describe physical, chemical and biological aspects of weathering and their effects in the field;
- point out examples of weathering;
- explain that weathering occurs *in situ* (in place) and movement of solid material away is not involved (although liquids can be/are

removed), since the removal of solid material would be erosion.

Context:

This activity can be carried out using any exposed surface of rocks, including natural and artificial rock exposures, but also building stones, monuments or gravestones. Manufactured materials such as bricks, tiles and concrete also show the effects of weathering.

Weathering is distinct from erosion, as described in the 'Underlying principles' section below. However, weathering and erosion usually work together; rocks are weakened by weathering and the weakened material is removed by erosion.

The question asking, 'Are the rocks lightly, moderately or heavily weathered?' is a difficult question to answer, because it depends upon the timescales being considered, but it is posed to encourage pupils to think about relative rates of Earth processes.

Remember to carry out a risk assessment before taking anybody to any rock exposure.

Following up the activity:

Continue with other 'Questions for any rock face' Earthlearningideas.

Underlying principles:

- Weathering is the break up and break down (physical break up and chemical breakdown) of rocks at the Earth's surface without the removal of solid material (although material can be removed in solution).

- Erosion is the removal of solid material, by gravity, water, wind or ice (as the start of transportation).
- The effects of weathering are usually visible as crumbling and/or discoloured surfaces, with biological effects caused by lichens or mosses/other plants.

Thinking skill development:

Pupils have to apply a definition (of weathering) to real world circumstances and so bridge the concept of weathering to their outdoor observations.

Resource list:

- the resources needed for pupil fieldwork listed in the Earthlearningidea, '*Planning for fieldwork: preparing your pupils before setting out to "ask questions for any rock face"*'

Useful links:

See: the Earthlearningidea, 'What's the difference between weathering and erosion?' at:

http://www.earthlearningidea.com/PDF/207_Weathering_erosion.pdf

The Field Studies Council provides a useful guide to coastal fieldwork, including weathering, at:

<http://www.geography-fieldwork.org/coast/coastal-processes.aspx>

A teacher guide to weathering and erosion is provided at:

<http://geographyclassroom2014.weebly.com/weathering.html>

Source: Devised by Chris King of the Earthlearningidea Team.

The 'Questions for any rock face' series of Earthlearningideas and the sites where they may be applicable

'Questions for any rock face' Earthlearningidea	Site
Planning for fieldwork	Preparation in school beforehand
1: weathering	Any exposure (cliff, coastal exposure, quarry, cutting) or weathered constructions (wall, gravestone, monument)
2: erosion	Any exposure and many walls
3: soil	Some exposures have a useful soil profile at the top (but many do not)
4: rock group (igneous or sedimentary)	Any exposure of igneous or sedimentary rock or both; also applicable to sedimentary and igneous building stones, gravestones or monuments
5: sedimentary grains	Any exposure of sedimentary rock and also building stones, gravestones or monuments
6: fossils	Any exposure containing readily found and obvious fossils, including some building stones, gravestones or monuments
7: tilted or folded rocks	Any exposure of clearly tilted or folded rocks
8: faults	An exposure where rocks are clearly faulted, preferably where beds can be matched up on either side of the fault
9: metamorphism	An exposure where metamorphic features are clearly visible and preferably, where there is also evidence of the former rock type
10: sequencing	An exposure where a sequence of geological events can be relatively dated using 'Stratigraphic Principles'
11. tectonic plates	An exposure of sedimentary rocks containing evidence of deposition in different climates and altitude/depths from today, with further evidence of plate margin processes
12. quarry/ cutting potential	An exposure in any quarry or cutting
13: quarry economics	An abandoned (or working) quarry
14: recording	Any exposure

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