Asks pupils why they think that some areas are hilly and others are low lying. Such differences in relief are often caused by the relative resistance to erosion of the rocks that make up these areas – more resistant rocks usually form higher areas.

Pupils can then test a variety of rocks, to see how well they might stand up to erosion, as follows: Take several “thumb-sized” pieces of the same rock type, place them into a plastic container and fix the lid. Shake the container vigorously for 20 seconds. Wait for the dust to settle, and then carefully tip out the contents onto a tray or a piece of paper. Keep the pile of dust on the tray, but put the recognisable fragments back into the container and shake for a further 20 seconds. Add the dust to the original pile. Then choose one or more other types of rock to investigate, and repeat the activity as above, producing a separate pile of dust for each rock type. Compare the sizes of the piles of dust from each rock type and put the rocks in order of their resistance to erosion by shaking: the rock that produces the least dust is the most resistant.

If there are no rocks locally available, the activity may still be carried out, using pieces of brick, or concrete etc. Although these cannot be related to the local landscape, the fragments will become rounded as a result of the shaking in the same way as natural rocks do. This is as much a part of erosion as is the wearing away of the landscape.

If a balance is available, the mass of the rock fragments may be measured before shaking and after each shake, and a graph of relative rock resistance may be drawn. The indoor activity may be followed up by a visit to a local site where rocks or other materials are being eroded.

The back up

Title: Rock, rattle and roll
Subtitle: Investigating the resistance of rocks to erosion by shaking in a plastic container
Topic: Shake a plastic container to erode rock fragments inside it. Use the differences in the resulting amounts of rock dust to compile a rank order of the resistance of the rocks to erosion. Follow up the activity with a local site visit where appropriate.

Age range of pupils: 10-18 years
Time needed to complete activity: 20 mins
Pupil learning outcomes: Pupils can:

- appreciate the need for a consistent approach to the investigation, e.g. shaking for the same time and trying to keep a uniform vigour of shaking with each set of rock fragments;
- observe differences in rounding of a range of materials after erosion;
- place results in rank order, based on visual inspection, or weighing;
- account for variation in relief (height) of the land where, as in most cases, this depends on the response of different rock types to erosion.

Context: This activity could be used to substantiate a geography lesson, or to examine the physical properties of a range of rock materials. Differences in rock resistance may explain variations in relief, but pupils should be
made aware that this is not the only factor. For example, many of the deep valleys of the
Himalayas are the result of the rivers cutting down as fast as the mountains are uplifted, and there
may be few differences in the rock types involved.

Following up the activity:
- Pupils may wish to experiment with one
  fragment of each of several different rock
types together in the shaker, to test the action
the fragments have on each other.
- The same process can be used to make
  rounded semi-precious gemstones for use in
jewellery.
- It is possible to carry out the investigation
  with the container half-full of water, to imitate
a river or the sea, (although it is difficult to
measure the amount of eroded material, and
it can be messy!).
- A field visit to a local river or beach would
  enable pupils to investigate the degree to
which different fragments of rock are rounded
by having been knocked together during
transport.
- Pupils can be asked to comment on the likely
  shape of a coastline made of different rock
types after many years of erosion by the sea.

Underlying principles:
- Erosion means “wearing away” (from the
  Latin erodere = to gnaw away)
- Erosion is not the same thing as weathering,
  Weathering involves the breakdown of rock
material in place by atmospheric agencies,
plant or animal action, and does not involve
the removal of the resulting solid debris.
- As rock fragments are transported by water,
ice, or wind, the fragments themselves are
rounded by being knocked against each
other. They also abrade the solid rocks
beneath them as they are moved. Both such
processes are part of erosion.
- The resistance to erosion of a rock fragment
  is controlled by the resistance of its
constituent minerals; how the crystals of
  crystalline rocks interlock; the strength of any
cement holding sedimentary rock particles
together and any preferred orientation within
the rock, such as planes of bedding or of
cleavage.

Thinking skill development:
- A pattern is established of the order in which
different rock types may be eroded.
- A cognitive conflict occurs when pupils realise
  that the resistance of the rock type may not
be the sole factor controlling the erosion of a
landscape.
- Relating the results of the shaker activity to
  the landscape around them demands
bridging skills in pupils’ thinking.

Resource list:
- a plastic pot with close-fitting lid
- fragments of different rock types or of
  materials such as brick or concrete
- paper, or a tray for tipping out the dust
- if available – a sensitive balance

Useful links: Try the Earthlearningidea activity
‘Ganges in a gutter’, published 25th February
2008, which can be adapted to produce an
erosional channel in sand.
http://www.bbc.co.uk/scotland/education/geog/coa
stline/standard/physical/features/erosion/?topic=ro
ck
http://www.apqj64.dsl.pipex.com/sfa/id87.htm -
see lesson 4.

Source: ‘The Dynamic Rock Cycle’ workshop
booklet published by the Earth Science Education
Unit,
http://www.earthscienceeducation.com/workshops
/rock_cycle/erosion.htm

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