‘Recreating’ the rocks seen in the field – step by step
Simulating a dipping sedimentary rock sequence through a sequence of Earthlearningideas

Help your class to understand how dipping sedimentary rock sequences form by taking them through a series of Earthlearningideas to ‘recreate rocks’ and the forces that tilted them. Do this in front of the exposures of the rocks themselves or by using photographs of tilted rock sequences.

1. Make sediment

If the sedimentary rocks are sandstones, mudstones or conglomerate, then give the groups the equipment they need to make sediment, using the *‘Rock, rattle and roll’* shaking activity. If they are limestones, then use the *‘Shell shake’* Earthlearningidea activity instead.


Making sediment – by shaking.
(*Peter Kennett and Elizabeth Devon).*

Pour out the broken-up material at the end of the activity and explain that this is the sediment that we will be forming into ‘rocks’.

2. Lay down sediment

Show how sediments are laid down in layers called beds by pouring layers of different-coloured sediments (including the ones you have just made) into a measuring cylinder of water, as in the *‘Laying out the rock cycle’* Earthlearningidea activity. Explain that this would deposit beds in a sedimentary sequence, even if the sediments were all the same colour, and you couldn’t see the layers.

Beds in a sedimentary sequence in a measuring cylinder. *(Peter Kennett).*

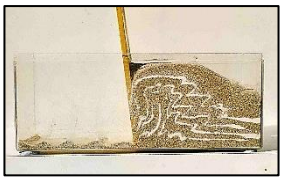
3. Make the sediments into sedimentary rocks

Give each group a sawn-off syringe, Plaster of Paris, the ‘recipe’ and the other equipment they need to make their sediment into ‘rock’ by compaction and cementation using *‘Make your own rock’* Earthlearningidea. It is unlikely they will have enough sediment from the shaking activity so they will need more (see resources list below). They should wash everything off in buckets when they finish. By the end of the session the ‘rocks’ should have set so that each pupil can take their own ‘rock’ home with them.

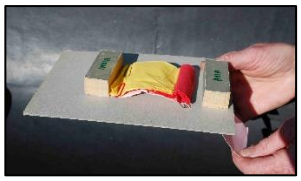
‘Making rock’ with sediment and Plaster of Paris. *(Peter Kennett).*

4. ‘Make mountains’ to tilt the sedimentary rocks

Demonstrate how flat-lying rock layers can be tilted like the ones in the rock exposure/photograph using either the *‘Himalayas in 30 seconds’* Earthlearningidea or the *‘Continents in collision’* cardboard Earthlearningidea model.



Folded and dipping layers in a plastic box. *(Peter Kennett).*



Cardboard model of continental collision. *(Peter Kennett).*

5. Summarise the sequence

Explain that this sequence of Earthlearningideas has shown how rocks were first sediment that was laid down flat before becoming sedimentary rock and then being tilted into the rock shapes they can see in front of them.

A primary (elementary) class recreating the rocks opposite the ‘Rock of Ages’ dipping Carboniferous Limestone sequence in Burrington Combe, the Mendip Hills, south west England. *(Amber Avery).*

‘Making rocks’ and explaining them in front of the ‘Rock of Ages’. *(Amber Avery).*

The back up

Title: 'Recreating' the rocks seen in the field – step by step.

Subtitle: Simulating a dipping sedimentary rock sequence through a sequence of Earthlearningideas.

Topic: Using a series of Earthlearningideas to show the steps by which a tilted sequence of sedimentary rocks was formed.

Age range of pupils: 7 years upwards

Time needed to complete activity: 30 minutes

Pupil learning outcomes: Pupils can:
- describe the series of steps by which loose sediments are formed and eventually become part of tilted rock sequences;
- explain how these different steps can be simulated and modelled.

Context:
This teaching strategy was carried out with four different primary (elementary) school classes in turn during the day in Burrington Combe, a limestone gorge in the Mendip Hills of south west England. The pupils were enthusiastic despite the warm weather and the staff were pleased as well.

The teaching strategy illustrates the sedimentary part of the rock cycle, as described in the *'Laying out the rock cycle'* Earthlearningidea activity.

Following up the activity:
The 'rock of Ages' Christian hymn was written by the Reverend Augustus Toplady in 1763. He was travelling along the gorge when he was caught in a storm and sheltered in a fissure in the rocks. He wrote down the title and the first words there. The hymn was published two years later. The first two and the final two lines are:

Rock of Ages, cleft for me,
Let me hide myself in Thee;

You could debate with your class whether the Rev. Toplady was right to use the phrase 'Rock of Ages', given that he had no idea of the age of the rocks at the time (the Carboniferous limestone rocks in which he hid are now known to be c 330 million years old).

The 'Rock of Ages' and small sign which marks its position. *(Released into the public domain by Rob Ward).*

- You could ask your class to assume that Rev Toplady was an intelligent man, but he knew nothing about modern geology. Ask them either a) to use their hands to explain how the rocks were laid down and tilted, or b) to work in pairs; one person should explain using words and ideas which Toplady could understand, how the rocks were laid down and tilted; the other person should pretend to be Toplady and give a mark out of ten for the explanation.

Underlying principles:
- The steps involved in forming a dipping sedimentary rock sequence are, in order: the formation of sediment; the laying down of sedimentary beds, usually as horizontal layers in water; the burial of the beds, causing the lower beds to become compacted and cemented into rock; the tilting of the rock sequence during a mountain-building episode caused by plate tectonic forces. After erosion the results can be seen.
- These steps can be modelled and simulated near the exposure or in the classroom.

Thinking skill development:
Developing understanding of the models used involves construction, application of these models to the 'real world' experience uses bridging skills and may involve cognitive conflict. Discussion of these thinking processes involves metacognition.

Resource list:

'Rock, rattle and roll' activity:
- a strong **plastic** pot with a closely-fitting lid and a wide enough neck to take the fragments
- fragments of different rock types
- paper, tray of clipboard for tipping out the dust

'Shell-shake' activity:
- a strong **plastic** pot with a closely-fitting lid and a wide enough neck to take the shells
- a variety of expendable shells, of varying resistance to erosion by shaking
- a few small pebbles
- paper, tray or clipboard for tipping out the dust

Bedding demonstration:
- a long transparent container such as a test tube or small measuring cylinder
- two containers of sediment of different colours
- small bottle of water, to nearly fill tube

'Making sedimentary rock' activity:
- old 20ml syringes with the nozzle end cut off with a hacksaw
- sediment from the two shaking activities, with extra play sand (to make 'sandstone' or crushed limestone (from garden suppliers) to make 'limestone')
- expendable small plastic cups or pots and stirring sticks
- Plaster of Paris
- water

'Himalayas in 30 seconds' activity:

- small transparent plastic or glass box
- piece of board to fit snugly into the box
- dry sand
- flour, or coloured powder
- spoon, etc. for adding the sand/powder
- wooden block to flatten out the sand/powder

Continental collision model:

- stiff cardboard
- thin cardboard
- paper serviettes or leaves of toilet paper
- two small wooden blocks;
- paper clips
- scissors
- sticky tape or staples

Useful links:
See the 'sedimentary rocks in a minute' presentation by Geobus at:
https://www.youtube.com/watch?v=DpKMuUKHYwQ

Source: Chris King of the Earthlearningidea Team.