

Rolling, hopping, floating and invisibly moving along Investigating how sediment is transported by water

Explain to the pupils that you want to find out how sediment, i.e. gravel sand and mud*, is picked up by the water in a river and moved downstream.

To represent the flow in a river, you use a circular bowl with a weighted object placed in the middle. Pour warm water into the bowl until it is about three-quarters full. Mix together one tablespoon of each of washed gravel, washed sand and salt. Sprinkle the mixture around the bowl and wait for it to settle.

Using a spoon, stir the water round and round very, very gently and observe what happens.
The very tiny sand grains start to stay up in the water and begin to move around the bowl.

Now stir a bit faster and observe what happens. More grains of sand start to move around the bowl.
Some grains appear to be bouncing along as they move round.

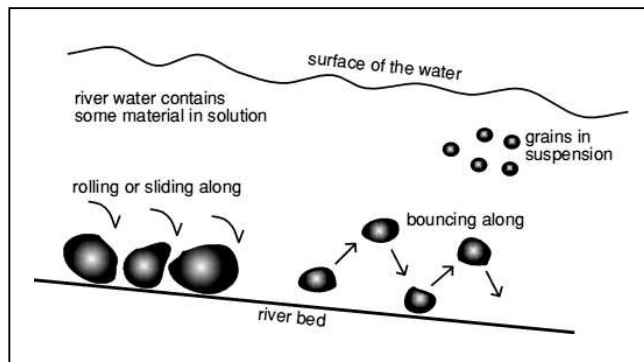
If you stir still faster, it will be possible to make the gravel move along. Ask the pupils what is happening now.
The gravel appears to be rolling or sliding along the bottom of the bowl.

Lastly, ask the pupils to observe what has happened to the salt.
It seems to have disappeared. In fact it has dissolved in the warm water and is now in solution.

The pupils could work in groups, each with their own bowl and sediment.

**Mud - we are not using mud (very fine clay particles) in the investigation because it makes the water cloudy so the other grains cannot be seen. It is of course present in all rivers.*

You could use this diagram to summarise the pupils' findings:-



Sediment transport
(Photo: Elizabeth Devon)

The back up:

Title: Rolling, hopping, floating and invisibly moving along

Subtitle: Investigating how sediment is transported by water

Topic: The activity can be used in any science or geography lesson. It can also be used for literacy in story-telling.

Age range of pupils: 5 - 14 years

Time needed to complete activity: 20 minutes

Pupil learning outcomes: Pupils can:

- observe that under very low flow, some grains become suspended;
- realise that with faster flow some sand grains bounce along while others are carried round and round by the flow;
- appreciate that a much faster flow is required to roll or slide the gravel grains along the bottom of the bowl.
- observe that the salt dissolved and went into solution;

Context:

Sediment is transported in water (rivers, the sea or currents in gutters) in solution, suspension, by saltation (bouncing along) and by traction (rolling or sliding along).

As the sediment is moved along the grains bump into one another and bump against the river or sea bed. They gradually become ground down or eroded; any sharp edges are worn away and the grains become more rounded and smaller.

Following up the activity:

Pupils could search for photos of rivers and suggest how the sediment in them is being transported, e.g. a river bed in a mountainous area might have big boulders in it. These could only have been moved along the river bed by very fast water flow. Other rivers look very muddy and no sand or gravel can be seen. These rivers are carrying a lot of sediment in suspension, and probably in solution as well.

Pupils could try the Earthlearningidea 'Mighty river in a small gutter'.

Pupils could make up stories about Sandy Grain and how he/she moves down the river. If they do this, they should be encouraged to include the fact that Sandy will be eroded and become more rounded and smaller the further he/she travels.

Underlying principles: (please refer to diagram below)

- At low flow, rivers transport fine-grained sediment in suspension.
- Any soluble material will dissolve in the water and be transported in solution.

- As the flow increases, sediment with a larger grain size can be transported and often moves by saltation.
- At high flow, larger grains will move by traction and roll or slide along the river bed.

Thinking skill development:

Pupils can see a pattern in how the sediment moves as they increase the flow. Discussion about what is happening involves metacognition. Cognitive conflict may be caused by the disappearance of the salt. Transferring what they have seen in the model to the real world is a bridging skill.

Resource list:

- circular bowl with a weighted object (beaker of water) stuck down with Blu tac™ in the middle
- quantity of washed gravel, washed sand** and salt
- tablespoons

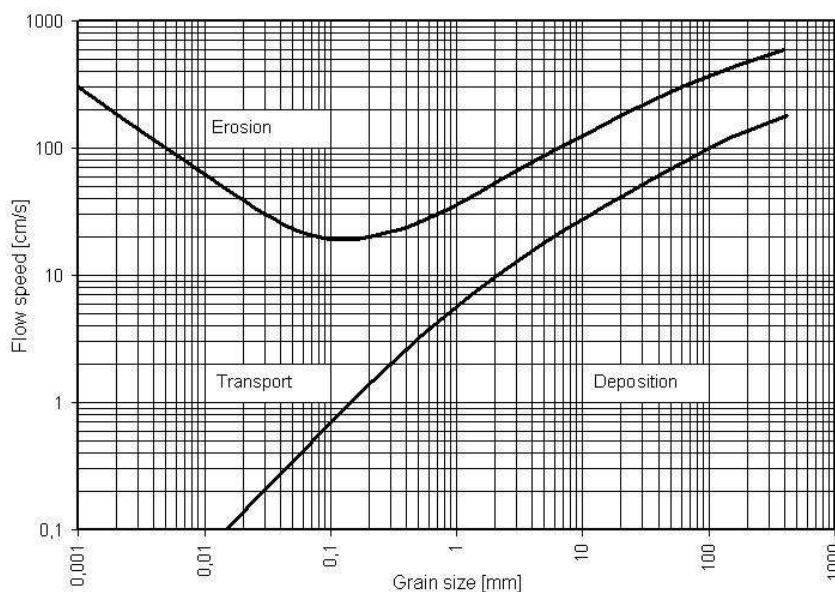
** Sand can be washed to remove the cloudy fine particles by putting it into a bucket, preferably somewhere outside, connecting a hosepipe to a tap and turning on the tap, and then stirring the sand with the hosepipe until the water overflowing the bucket runs clear.

Useful links:

Earthlearningidea 'Mighty river in a small gutter' <http://www.earthlearningidea.com>

Source:

Developed by Elizabeth Devon of the ELI team.



The Hjulström-Sundborg diagram, showing the water flow speeds that erode, transport and deposit grains of different sizes

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