

## Soil Grain Size– Teacher Notes

**Soils are the top layer of most of the Earth’s crust, consisting of the unconsolidated products of rock erosion and organic decay, along with bacteria and fungi.** Most soils have a variety of grain sizes.

Clay soils are very fine grained and feel smooth and silky to touch.

Silty soils are mostly fine grained but have a slightly gritty texture.

Sandy soils are mostly medium to coarse grained, individual grains being easily seen.

In Soil Science laboratories they sieve soil through expensive brass or stainless steel sieves of different mesh grades. Often seed growing soil mixes require slightly coarser soils because they allow easier penetration of water and developing roots.

A quite efficient, and much cheaper estimation can be made using the natural subconscious ability of our hindbrain or cerebellum to measure the difference between what is sensed by nerves in each hand.

### Student Activity

1. Ask your students to place the palm of one hand on their face and the other on the top of their desk and ask them which is cooler? **The desk.** Did you have to think hard to make that decision? **No**
2. Ask your students to keep one hand on their face and place the other either on the carpet or on the sole of their shoe and ask them which is rougher? **The carpet/sole of the shoe.** Did you have to think hard to make that decision? **No**
3. Repeat with bowls of warm and cool water.

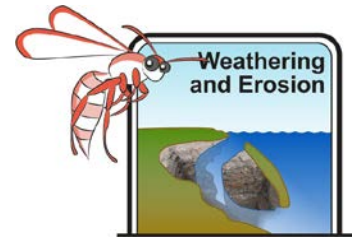


We can compare sensations with our left and right hand effortlessly. By testing the grain sizes in some soil with one hand against the standards of the batten in the other, students can estimate the proportions of coarse, medium and fine particles in the soil without stress.

### A Materials to make the standard C, M & F batten

I use garnet paper rather than the traditional sand paper because the red colour is striking and is more able to cover subsequent stains.

- Strong scissors
- 1 sheet of 40-grade sandpaper cut into 2.5cm squares. This is the **coarse** grain reference.
- 1 sheet of 120-grade sandpaper cut into 2.5cm squares. This is the **medium** grain reference.
- 1 sheet of 240-grade sandpaper cut into 2.5cm squares. This is the **fine** grain reference



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- A piece of stiff cardboard or plastic 15cm by 5cm. The battens in the photograph were cheap plaster scrapers provided by the local hardware store.
- Glue (the stronger the better)
- A pen

### Method

#### Teacher preparation:

1. Cut out the battens.
2. Cut out the sandpaper squares.

#### Student method:

3. Write your name on the back of the batten
4. Collect a square of each grade of sandpaper
5. Stick the sandpaper onto the batten with the:  
**C**oarsest at the top.  
**M**edium at the middle.  
**F**inest at the foot.  
(You may wish to label them **C, M & F**).

### B To measure the grain size of a soil

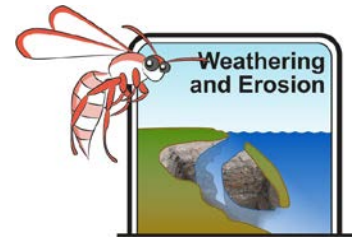


#### Materials

- A container of dry soil
- A **CMF** batten
- A hand lens (option)

#### Method

1. Gently shake the soil a little to separate out the larger grains to one edge of the container (see above).
2. Hold the CMF batten in one hand with your thumb gently rubbing against the coarse sandpaper at the top.
3. Rub the soil between the finger and thumb of the other hand.
4. Is the soil coarser or finer than the sandpaper?
5. Repeat with the medium and fine sandpapers.



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### Observation

Which grain size (or sizes) is in your soil specimen? \_\_\_\_\_

What proportion of each was there? \_\_\_\_\_

### Discussion

Would the grain size measurements you have collected be considered as good scientific data?

Explain your answer.

Although these measurements are good enough for the average gardener, they are not sufficient to be classified as scientific data.

Scientific data has to be:

1. Observable      They were
2. Measurable against International Standards. Our results would have to be reported in specific measurements such as between 0.05 and 0.3mm, not as generalisations such as “medium”.
3. Repeated      We only measured once

This is why soil laboratories use sieves that only permit specific grain sizes to pass through to provide data for their reports.