POROSITY DEMONSTRATION

This demonstration is to show that in well sorted sediment the porosity is not affected by the grain size. It also is to introduce the terms, yield and retention and to show how these are affected by grain size.

You will need 4 identical 1 litre transparent beakers, glass is clearest but glass is easily broken by the pebbles.
Fill two of the beakers with 400ml of water, preferably dyed blue with food colouring.
Fill one of the others with 400ml of well sorted medium sand and the last one with 400ml of well sorted pebbles.
You will also need a separate container to pour water into, and a piece of plywood large enough to cover the top of a beaker which has been scratched with parallel lines with a nail.
Provide each student with a copy of the sheet attached.

Stand the beakers on the front desk.

Ask the students which will hold the most water, the sand or the pebbles. They should fill in their sheets with their prediction. Nearly all students predict that the pebbles will. Of the several hundred students I have demonstrated this to none has predicted the sand and pebbles will hold the same amount of water.

Pour the 400ml of water carefully into the sand until the water level reaches the top of the sand. Then pour the other 400ml of water into the pebbles till it nearly covers them. (If you tip the water in a little bit at a time when it has nearly covered the pebbles you can check that the water remaining in the two beakers is the same)

Show the students the water levels in the sand and pebbles and then that the other beakers have the same amount of water left in them. Get a student to read out the volume of water in the beakers without sediment.

Students fill in their tables and work out the volume of water in the sediment, write a comment on their sheets and then calculate the porosity.

The students must then make two further hypotheses. You will need to check that they are writing the hypotheses.

Dispose of the water in the beakers without sediment. Now using the piece of plywood drain as much water as possible from the pebbles into an empty beaker. Then drain as much water as possible from the sand into another empty beaker. Be very careful not to let any sand out. The scratch marks help the water to drain without letting any sand out. Stop when the drips are coming very slowly.
Read and record the volumes of water drained out of the sand and out of the water. Students then complete their sheets.

POROSITY

Hypothesis 1   Which will hold the most water, the sand or the pebbles?

		sand	pebbles
a	volume of sediment		
b	volume of water		
c	volume of water remaining		
d	volume of water in sediment = b-c		

Comment

e	porosity = d/a x 100	%	
			%

Hypothesis 2 Which will let the most water drain out?

Hypothesis 3 From which will the water drain out fastest?

f	volume of water poured out		
g	volume of water left in the sediment =d-f		
h	yield = f/a x 100		
		%	%

Comment

i	retention = g/a x 100		
		%	%

Comment

Check that porosity = yield + retention