

Video question script: The watery world ...

Question/Activity	Likely response	Rationale
In teaching about the Earth we use outdoor activities to explore Earth materials. This example explores the surface processes going on outside, through the Earthlearningidea: <i>The watery world of underground chemistry</i> . The activity can act as an introduction to Earth system science by showing how all Earth's spheres are connected		An introduction to the workings of Earth processes locally and their interconnectedness through the interactions of Earth's spheres
Take the class to an area of soil outside and take them through this five-phase activity. If they are not familiar with the pH scale and Universal indicator – they should be introduced to these beforehand		
Phase 1 Tap water (or rainfall) Ask what colour they expect Universal indicator to turn when it is added to tap water (or rainwater, if you have some available)	Most will predict that the water is not acid or alkali, but will show a neutral green colour	Bridging of previous knowledge to a new situation
Add indicator, the water will normally turn green or slightly bluish green, showing it is neutral or slightly alkaline (You may want to note that tap water has usually had alkali added to it to reduce corrosion of pipes)		
Ask what will happen when the water is poured onto the ground	Most will say it will soak into the soil.	The bridging of previous knowledge to a new situation
Phase 2 Soil water Pour the water onto the ground and watch it soak into the soil. Ask what will happen to the water within the soil; you may have to remind them that the soil contains decaying vegetation that is likely to produce acid, and that it contains animals that are respiring, producing carbon dioxide	Most will predict that the water will become more acid	Construction of a pattern based on previous knowledge
Ask how we could mimic the effect that carbon dioxide from respiring animals has on the water	They may suggest that someone blows air into the water using a straw and that the indicator colour will change	Lateral thinking necessary here
Put some more water into the glass, add indicator, ask someone to blow into the water using the straw for some time (e.g. 30 seconds) – the indicator will normally turn yellow (sometimes orange), showing that a weak acid has formed		
Ask what will happen next to the acidic water in the soil	They may suggest that some will stay in the soil, some will be lost through transpiration by plants or evaporation from the soil surface, but some will trickle into the rocks below to become groundwater	Construction of a pattern based on previous knowledge
Phase 3. Groundwater Ask how the acidic water is likely to affect the rocks beneath	Most will suggest that a chemical reaction will occur and the water will become neutral again	Construction of a pattern based on previous knowledge

Ask what will happen to this water over time; you may have to give the clue that water will flow through pore spaces in the rocks and will also flow downhill	Some will say that the water will flow sideways	Application of previous knowledge
Ask whether this water will come out of the ground	Some will say the groundwater will leak out in a spring	Construction of a pattern based on previous knowledge
Phase 4. Spring water Now ask what colour they would expect Universal indicator to turn in still (non-carbonated or 'fizzy') spring water	Most will predict it will turn a neutral green colour	Construction of a pattern based on previous knowledge
Get out the bottle of spring water, open it, pour some into the glass and test it with indicator. It will normally go a neutral green or a slightly alkaline bluish green		
Phase 5. Linking the Earth's spheres Ask which of the Earth's spheres have been mentioned in the discussion; the atmosphere, hydrosphere, biosphere or lithosphere	Many pupils will realise that the atmosphere (rainwater, origin of tap water); hydrosphere (trickling into the soil, soil water, groundwater, springs); lithosphere (soil and rock); and biosphere (animals and plants in the soil) have all been discussed	Construction of a picture of interacting processes through bridging all the previous work to global processes