

Earth science

Big idea (age 11-14)

EEC: Earth Chemistry

What's the big idea?

Substances can move between Earth's atmosphere, hydrosphere, geosphere and biosphere as part of large-scale systems.

Key concepts

The big idea is developed through a series of **key concepts** at age 11-14, which have been organised into teaching topics as follows:

Topic EEC1

Air pollution

Key concepts:

1.1 Air quality

Topic EEC2

Water cycle

Key concepts:

2.1 Water cycle processes

Topic EEC3

Acids and alkalis

Key concepts:

3.1 Acid rain

Topic EEC4

Weathering and erosion

Key concepts:

4.1 Chemical weathering

The numbering gives some guidance about teaching order based on research evidence on learning pathways and effective sequencing of ideas. However, the teaching order can be tailored for different classes as appropriate.

Guidance notes

Some key concepts in this Big Idea provide necessary prior understanding to topics in the big idea Dynamic Earth, in particular the formation of sedimentary rocks and fossil fuels.

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Learning progression

The science story associated with the big idea develops from age 5 to age 16, and could be summarised as follows:

Science story at age 5-11

Simple water cycle

Water evaporates from rivers, lakes and seas. It condenses, forms clouds and falls as precipitation. Rivers flow into the sea and the cycle begins again.

Air

Air is not nothing. Air has mass.

Science story at age 11-14

Air quality

Unpolluted air is a mixture of substances (including nitrogen, oxygen, carbon dioxide, water, argon and other gases). Human activities such as burning fuels and natural events (such as volcanic eruptions) can add different substances to the air. These processes can also increase the amount of existing gases. These additional substances are referred to as air pollutants.

Water cycle processes

A water cycle diagram shows the relationship between a range of processes that create a large-scale system. Water (H₂O) is conserved but can move within and between the hydrosphere, atmosphere, geosphere and biosphere through visible (surface water flow, precipitation) and invisible (groundwater flow, evaporation, condensation, percolation) processes.

Acid rain

Substances in the atmosphere can chemically react. Some substances in the atmosphere can dissolve in water that is also present.

Acid rain forms when sulfur dioxide or nitrogen monoxide react with oxygen in the air before dissolving in water to form sulfuric or nitric acid.

Chemical weathering

During chemical weathering the minerals that make up rock are chemically altered through a chemical reaction. This can weaken the rock causing it to break up. If the product of the reaction is a solution the rock will appear to be worn away.

Science story at age 14-16

Potable water

People take their water from a range of sources including surface water, sea water and ground water. Water treatment methods are used to ensure that the water is safe to drink (potable).

Carbon cycle

Carbon (in the form of chemical compounds) moves between the hydrosphere, atmosphere, biosphere and geosphere as part of large-scale Earth systems.

Evolution of the atmosphere

The percentage of composition of Earth's atmosphere has changed over time. The relative rates of addition and removal of a substance to and from the atmosphere determine the amount of the substance that is in the atmosphere.

Climate change

The level of carbon dioxide in Earth's atmosphere depends upon the relative rate at which it is added and removed. There is a correlation between increased carbon dioxide levels in the atmosphere and average global temperature. At higher temperatures the amount of water in the atmosphere increases which affects weather systems.