

Teaching Earth Science to develop thinking skills: the CASE approach

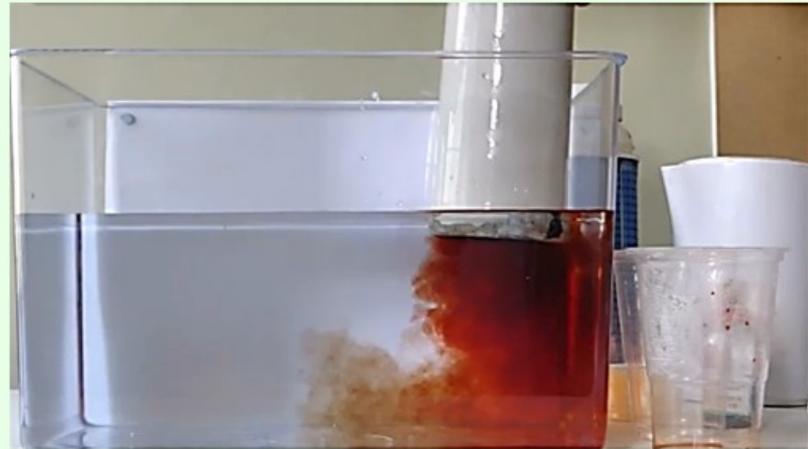
Earth science for science and geography
– online workshop

The CASE Programme

Read out loud the colour you see:

Red

Earth science to develop thinking skills



Please have a pen/pencil and paper ready to write down answers to questions – or discuss the answers with your group

www.earthlearningidea.com

Earth Learning Idea

Innovative, Earth-related teaching ideas

Earth science to develop thinking skills

Purpose – ESEU background

Many Earthlearningidea online video workshops are based, with permission, on workshops originally developed by the Earth Science Education Unit (ESEU)

These were designed as interactive workshops for teachers and trainees, involving interaction, discussion and presentations by participants to others

Global research into professional development workshops shows that these aspects are critical to success

ESEU research shows that this workshop approach is highly successful in changing teaching in schools; evaluation feedback has also been very strong

Earth science to develop thinking skills

Purpose – Earthlearningidea development

The Earthlearningidea Team has developed the ESEU workshops into online video workshops for those unable to take part in face to face interactive workshops

Each workshop is led by a PowerPoint presentation and has an accompanying booklet that contains all the activity background details, resource lists, risk assessments, etc.

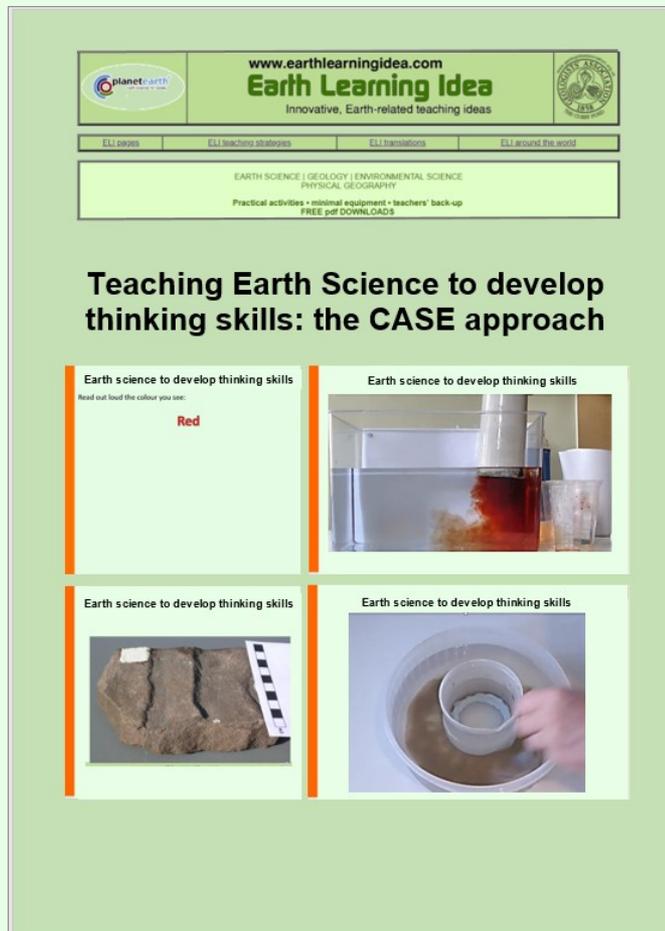
The individual workshop activities have been published for open access online at the website:

<https://www.earthlearningidea.com/>

Each workshop activity has a question script and a video keyed into CASE principles, that can be accessed through the PowerPoint hyperlinks

The aim is to facilitate online Earth science learning

Earth science to develop thinking skills



The screenshot shows the website for Earth Learning Idea, which includes a navigation menu with categories like 'ELL cases', 'ELL teaching strategies', 'ELL transitions', and 'ELL around the world'. Below the menu, it lists subject areas: 'EARTH SCIENCE | GEOLOGY | ENVIRONMENTAL SCIENCE | PHYSICAL GEOGRAPHY'. The main content area features a booklet cover with the title 'Teaching Earth Science to develop thinking skills: the CASE approach'. The booklet cover is divided into four panels, each titled 'Earth science to develop thinking skills':

- Top-left panel: Text reads 'Read out loud the colour you see:' followed by the word 'Red' in red font.
- Top-right panel: A photograph of a laboratory experiment showing a red liquid being poured into a beaker.
- Bottom-left panel: A photograph of a soil sample with a ruler for scale.
- Bottom-right panel: A photograph of a hand holding a white cup over a bucket of brown liquid.

Earth science to develop thinking skills

– Earth science for geography and science

The booklet contains a workshop summary, the outcomes, teacher guidance and resources

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Summary

Use Earth science concepts to develop thinking skills using the Cognitive Acceleration through Science Education (CASE) approach. The CASE approach, shown by research to be very effective in developing the thinking skills of pupils, is developed in two classroom contexts, using a tank to teach about the atmosphere and oceans and using a circular bowl and tank for learning about the movement of sand by water currents. All Earthlearningideas, including those used in this workshop, can be found at: <http://www.earthlearningidea.com/>.

Workshop Outcomes

The workshop and its activities provide the following outcomes:

- the development of thinking skills through CASE principles: concrete preparation, construction, cognitive conflict, metacognition and bridging;
- understanding of how fluids are driven by density differences in the atmosphere and oceans;
- understanding of how water currents move sand and form ripples.

Earth science to develop thinking skills

Explore Earth science teaching approaches through CASE using these activities:

- The use of CASE to develop thinking skills
- Atmosphere and ocean in a tank – an example using CASE
- Sand movement – an example using CASE

Earth science to develop thinking skills

Workshop video run times	m	s
Earth science to develop thinking skills	37	15
The use of CASE to develop thinking skills	7	23
Atmosphere and ocean in a tank – an example using CASE	15	37
Sand movement – an example using CASE	14	15

Earth science to develop thinking skills

Hands on Earthlearningideas

- The use of CASE to develop thinking skills

Go to: <https://www.earthlearningidea.com/Video/CASE.html> hyperlink

Earth science to develop thinking skills

Hands on Earthlearningideas

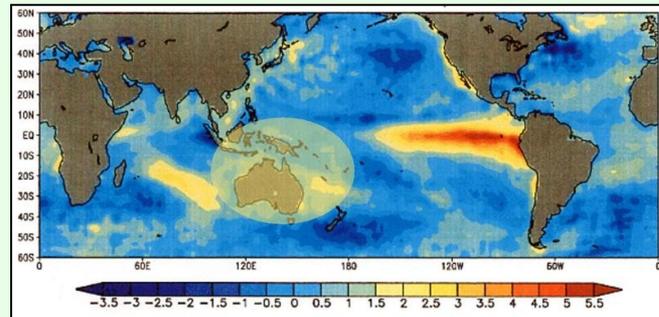
- Atmosphere and ocean in a tank
– an example using CASE

Go to: https://www.earthlearningidea.com/Video/Atmosphere_ocean.html hyperlink

Hands on water Earthlearningideas

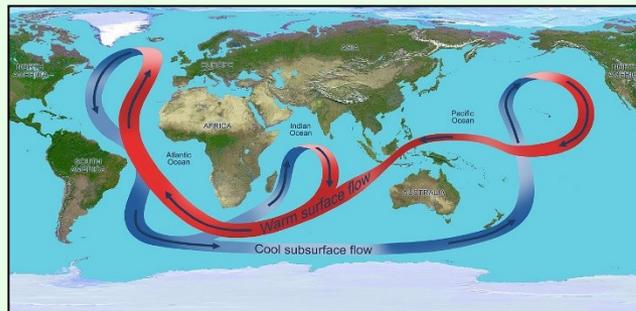
This is a model of the oceans:

- Warm water currents flow across the surface – El Niño in the Pacific Ocean, Gulf Stream in the Atlantic Ocean



*Public domain -
from U.S. National
Oceanic and
Atmospheric
Administration*

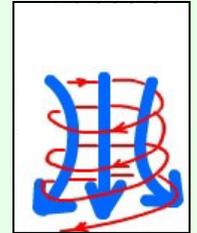
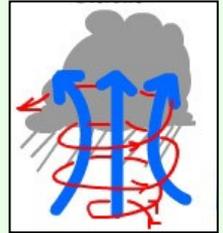
- Cold water currents sink in polar regions – and drive the deep ocean circulation



*Public domain -
created by NASA*

- Earthquakes trigger continental slope landslides, which distribute turbidity current flows over thousands of km² ocean floor

Hands on water Earthlearningideas



Public domain: António Miguel de Campos

This is a model of the atmosphere:

- Warm air rises and spills across the upper atmosphere; rising air produces low pressure
- Cold air sinks and flows across the ground
- What do we call air flowing across the ground?
- Wind
- These are high pressure conditions
- Dusty density currents in air: dust storms, avalanches, nuée ardentes, nuclear base surges

Dust storm

Public domain United States Marine Corps

Avalanche

<https://www.camptocamp.org/> CC BY-SA 3.0

Pyroclastic flow (nuée ardente)

Public domain USGS

Nuclear explosion base surge

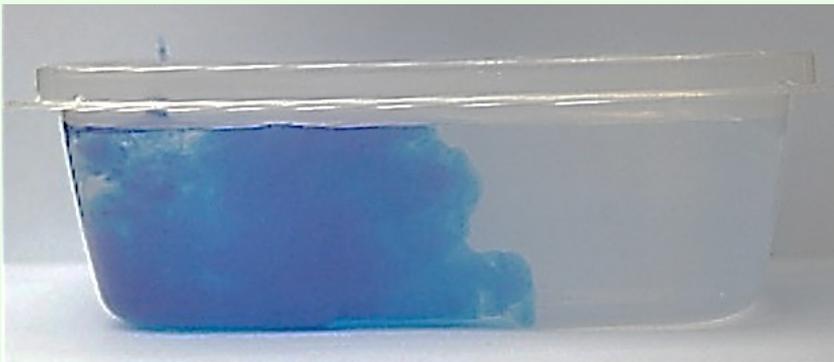
Public domain US government



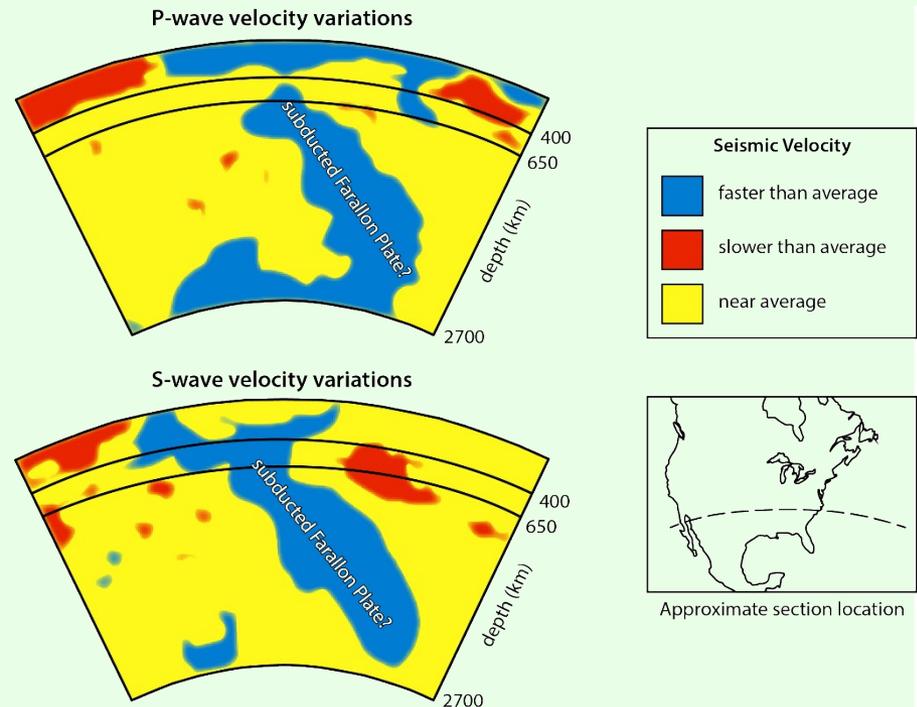
Hands on water Earthlearningideas

This is a model of the solid Earth:

- Cold lithosphere sinks

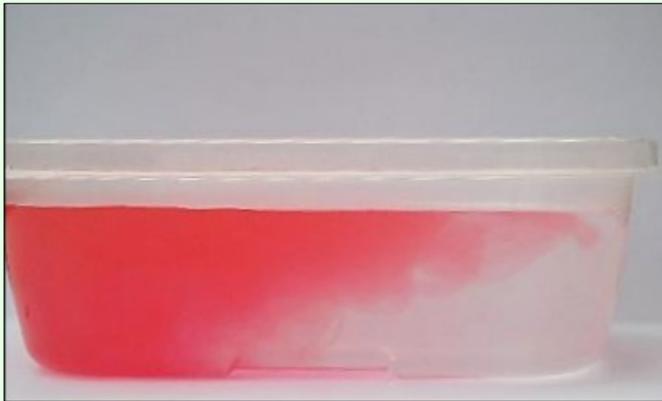


- This is the slab-pull mechanism – driving plate tectonic movement



Earth science to develop thinking skills

Atmosphere and ocean in a lunchbox
(for those who do not have a tank)



Hot red water in a lunchbox



Cold blue water in a lunchbox



Milk in a lunchbox



Cold coffee-coloured water
in a lunchbox

Earth science to develop thinking skills

Hands on Earthlearningideas

- Sand movement
 - an example using CASE

Go to: https://www.earthlearningidea.com/Video/Sand_ripples.html hyperlink

Earth science to develop thinking skills

Ripple marks in a washbowl



- Asymmetrical ripple marks – in which direction was the current flowing?

- Symmetrical ripple marks – in which direction were the wave crests? Which direction the beach? Which direction the coastline?

Ripple marks in a tank



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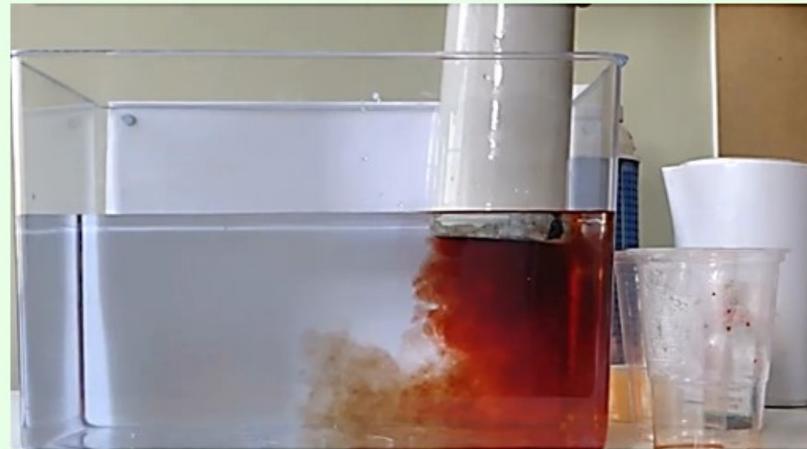
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