



WORLD OCEANS DAY

Teachers' notes

Summary

A standalone science lesson that introduces pupils aged 10-14 to the topic of ocean acidification through video, experiments and activities.

The learning objectives for this lesson are:

- Know what ocean acidification is
- Understand how ocean acidification affects plants and animals
- Reflect on the impact of ocean acidification on the food web

Prior learning

Pupils should have an understanding of the following:

- The causes of increased atmospheric carbon dioxide
- Acids, alkalis and pH
- Food webs
- Interpreting basic graphs

Key words

Pupils may need the following terms explained to them:

- Acidification – the process of becoming more acid or converting into an acid
- Phytoplankton – small marine plants such as types of algae e.g. diatoms and coccolithophores
- Zooplankton – small marine animals e.g. copepods and pteropods and also the larvae of larger animals

Background reading on ocean acidification

- [de] Oceans Fact Sheet – Ocean acidification
In the same ZIP folder as this document or downloadable from: <http://oceans.digitalexplorer.com/resources/fact-sheets/>
- [de] Oceans Fact Sheet – The process of ocean acidification
In the same ZIP folder as this document or downloadable from: <http://oceans.digitalexplorer.com/resources/fact-sheets/>

Additional background information can be found on the UK Ocean Acidification Research Programme website:

<http://www.oceanacidification.org.uk/pdf/OA.english.web.pdf>



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Preparation

For the lesson, you will need:

- WOD lesson slideshow – in the same ZIP folder as this document

For Mission 1 – to know about ocean acidification, you will need per pair:

- 2 beakers
- Seawater or tap water (approx 200 ml)
- 2 straws
- Universal indicator or electronic pH meter
- 'Ocean acidification in a cup' worksheets are available in the same ZIP folder as this document, or downloadable from: <http://oceans.digitalexplorer.com/resources/experiment-ideas/>

For Mission 2 – to understand how ocean acidification affects plants and animals, you will need per pair:

- Beaker
- Shell (oysters work best)
- Vinegar (clear pickling vinegar works well)
- 'Dissolving shells in vinegar' worksheets are available in the same ZIP folder as this document, or downloadable from: <http://oceans.digitalexplorer.com/resources/experiment-ideas/>

For Mission 3 - to reflect on the impact of ocean acidification on the food web, you will need per pair:

- Scissors
- Glue
- Copy of each of the two marine food web worksheets, available in the same ZIP folder as this document



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Lesson plan

Aims / Objectives

Activities

Resources

Outcomes

STARTER:
WHAT'S HAPPENING TO THE OCEANS?

10 minutes

Use the slideshow to introduce pupils to the oceans to celebrate World Oceans Day.

You could use Google Earth or an inflatable globe to show how much of the world is covered by the oceans.

Use the Acid Test video to introduce the topic of ocean acidification.

Use slides 4-10 to show how scientists are researching these topics.

[Google Earth may need to be installed – free download of the current version from: <http://earth.google.com>]

Inflatable globes

Acid Test 3 minute version from: <http://youtu.be/aG3n1fAa7vk> or <https://vimeo.com/8990924>

Slides 4-10 of slideshow

Know the importance of the oceans

Understand the issue of ocean acidification

Learn how scientists research the oceans

MISSION 1:
OCEAN ACIDIFICATION IN A CUP

15 minutes

Explain the basic process of ocean acidification using slide 11.

Pupils are now going to see how by blowing through a straw into a beaker of water, the water becomes more acidic.

Ask pupils to follow the instructions on slide 12. What differences can they see after 1 minute, 2 minutes, etc?

Use slide 13 for a mini-review.

Per pair:

- 2 beakers
- Seawater or tap water (approx 200 ml)
- 2 straws
- Universal indicator or electronic pH meter
- Worksheets are available in the same ZIP folder as this document, or downloadable from: <http://oceans.digitalexplorer.com/resources/experiment-ideas/>
- Slides 11-13 of the slideshow

Know the process and chemistry of ocean acidification

MISSION 2:
DISSOLVING SHELLS IN VINEGAR

10 minutes

Using slide 14, explain that as atmospheric CO₂ continues to increase, the pH of the oceans continues to decrease. At pH7.7, the oceans will become corrosive to some organisms. This is likely to happen by 2150.

Pupils are now going to see how an acid (vinegar) affects a carbonate shell, following the instructions on slide 15.

Use slide 16 for a mini-review.

Per pair:

- Beaker
- Shell (oysters work best)
- Vinegar (clear pickling vinegar works well)
- Worksheets are available in the same ZIP folder as this document, or downloadable from: <http://oceans.digitalexplorer.com/resources/experiment-ideas/>
- Slides 14-16 of the slideshow

Understand the impact of acid on organisms with carbonate shells or structures

MISSION 3:
MARINE FOOD WEB

15 minutes

Using slide 17, explain that organisms with carbonate structures are most at direct risk from ocean acidification, but what are the implications for the entire food web?

Then ask pupils to complete the food web by cutting out the different Arctic animals and sticking them in the right order on the sheet (see slide 18, with answers on slide 19).

Use slide 20 for a mini-review.

Per pair:

- Scissors
- Glue
- Copy of each of the two marine food web worksheets in the same ZIP folder as this document
- Slides 17-20 of the slideshow

Reflect on how ocean acidification does not just affect plants and animals with carbonate shells and structures, but the entire marine food web

PLENARY:
REFLECT & CONNECT

10 minutes

Using slide 21, ask pupils to copy and complete the 'Reflect and Connect' diagram.

Answers and ideas can be shared to complete the lesson.

Slide 21 of the slideshow

Reflect on learning and link pupils' behaviour to ocean acidification (i.e. using a car vs walking to school, leaving lights on, etc.)

