

Theme 5. Water

Teacher guide - Ages 11-14

Preparation

Review the material and watch the videos. Do some preparation on the topic. For the Outdoor experience some materials are required (see Materials section below). Feel free to add any resources or materials you have available to enrich the lessons. Also check the *Introduction lesson Teacher guide* for useful tips and suggestions for preparing and giving the lessons within a theme.

Learning goals

The students ...

- learn about the oceans.
- know what the problems in the oceans are and what causes them.
- know what the terms overfishing, catch quota and dead zone mean.
- know the solutions to reduce and solve the problems in the oceans.
- know what clean drinking water is and how it is made.
- know what people use water for in and around the house.
- know how to save water.
- want to inform others of what they have learned.

Key vocabulary

- the Earth
- the blue planet
- the ocean
- oxygen
- climate
- tap water
- fresh water
- seawater
- groundwater
- water body
- overfishing
- a fishing quota
- plastic
- the dead zone
- acidification
- the water cycle
- drinking water
- water purification plant
- drinking water plant
- save water



Introduction

[Slides 3 and 4]

Fill four glasses with tap water without the students seeing you do so. Put the glasses on a table and place four cards next to them, turned over so that they are not yet legible (written on them is: shower - tap - toilet - - washing machine).

Tell the pupils that you have collected water from four different places: from the tap, from a (flushed) toilet, from the shower and from the washing machine tap. Which water comes from where? Can you see it? Do the students think it is possible to taste a difference? Turn over a card each time you have guessed one. Finally, come to the conclusion together that there is no difference between the four glasses of water. *We all use clean drinking water for all these things (toilet, shower, washing, tap).*

After this, discuss the learning goals of this theme.

Instruction

Problem

[Slides 5 - 10]

Explain that this lesson is about water. *Water is an important part of our lives. We live on a planet with large oceans and we use water every day. Without water, there would be no life.*

Complete exercise 1 and explain the answer.

Watch the film.

Complete exercise 2. Look at the world map with the pupils. It is easy to see that the oceans are all connected.

Watch the film.

Complete exercise 3a and explain:

- *The ocean absorbs a lot of CO₂. Tiny plants feed themselves with the help of sunlight and carbon dioxide. About a quarter of the carbon dioxide we release in the air is absorbed by oceans. Trees and plants also absorb carbon dioxide.*
- *Oceans also regulate global climate. They mediate temperature and drive the weather, determining rainfall, droughts and floods.*

Complete exercise 3b

The oceans and medicines: Scientists use plants, but also for example coral from the oceans to develop medicines.

[Slides 11-15]

Explain that we are not being careful with our oceans. *People's behaviour causes problems, for example:*

1. *Plastic*
2. *Overfishing*
3. *Dead zones*
4. *Acidification*

Discuss further about plastic in the ocean. What is plastic waste in the ocean referred to as? *Plastic soup is everywhere in the ocean. We are not talking about a kind of floating plastic island. Rather, it is about the very small particles of plastic (microplastics), together with the larger pieces of plastic. The currents in the ocean ensure that there is more plastic in some areas.*



The plastic in the ocean is not only extremely dangerous for the animals in the sea, it is also dangerous for human health. Ask them why.

Small marine animals ingest the microplastics (they mistake them for food). Larger animals in turn eat the small animals and these animals are in turn eaten by fish. And what about us? Well, we eat fish and therefore also get plastic in our bodies.

Complete exercise 4.

[Slides 16-17]

Dead zones

Explain the following:

There has been a drop in the oxygen levels in some areas in the ocean. This is a threat to life in these areas.

Acidification

The ocean absorbs about a quarter (25%) of the CO₂ we release into the atmosphere. This changes the chemistry of the seawater, this is called ocean acidification. When water is too acidic, the chemistry of the water changes. Animals like mussels, may not be able to make strong shells. Corals could also be affected.

[Slides 18-19]

Warmer oceans affect weather patterns, cause more powerful tropical storms and can impact many kinds of sea life, such as corals and fish. Warmer oceans are also one of the main causes of rising sea level.

Because of climate change, the ocean warms up. This problem can be solved, for example, by reducing Co₂ emissions.

[Slide 20- 22]

You have seen that the Earth is a planet with a lot of water.

Ask the students: *Will the water on Earth ever run out?* What do the students know about this? Watch the film and complete exercise 5.

Complete exercise 6.

[Slide 23-26]

Watch the film. *Can you explain how we get clean drinking water?*

Let the students share what they know. Also discuss what happens to the water that we flush away in our house (flushing, draining, washing away).

Complete and discuss exercise 7.

The clean drinking water from the drinking water plant goes to the houses via underground water pipes. So to flush the toilet we use the same clean drinking water as for cooking. How do the students feel about this? Is this necessary?

Complete and discuss exercise 8.



[Slide 27-28]

Too much water is used and it is important to be sparing with the water we use. There is a lot of water in the world, but very little of it can be put to good use. Only 3% of the world's water is fresh, the rest is salty seawater. And it takes much more effort to make salty seawater drinkable.

It costs a lot of energy to purify water and make it available at our taps. For example, the dirtier the rivers, the more energy it takes to clean them.

[Slides 29]

A solution

We have seen how humans treat the oceans. Do you remember what problems there are?

1. Plastic
2. Overfishing
3. Dead zones
4. Acidification

Thankfully, solutions are being worked on.

[Slides 30-31]

Overfishing

To prevent overfishing, a fishing quota has been set.

Complete exercise 9 and explain the answer.

A fishing quota indicates how much of a certain fish species each country is allowed to catch. In Europe, fish quotas are set every year in Brussels. All ministers who deal with fisheries from different EU countries come together. Various biologists then advise them on how much fish of a certain species may be caught that year. Usually this advice is followed, but every fisheries minister tries to agree on the highest possible amount of fish for his country.

[Slides 32-36]

Plastic

Explain that a lot is being done to solve the plastic soup problem. For example, *The Ocean Cleanup* by Boyan Slat.

It is also important to ensure that plastic does not end up in the sea. Watch the film.

Complete exercise 10a, b, c.

[Slides 37 - 40]

Ask the following trivia question: *How many liters of water does an average family use each day when flushing the toilet?*

Let the students answer. *That is 20 litres of water.*

We are not careful with our water and waste too much (clean) drinking water. It is important to use water sparingly. It costs a lot of energy to purify water.

Water is taken from groundwater and rivers. This water is turned into clean water in the drinking water plant. The water that has been used in our homes goes through the sewers to a sewage treatment plant.

Complete and discuss exercise 11.



[Slides 41 - 43]

What can you do?

Complete and discuss exercise 12. What solutions do the students already know of? Which ones are they going to share with their parents at home?

Complete exercise 13.

Discuss which points can be done easily or immediately (stand at number 1) and what other points will take more time.

Think about how things are going at school. Complete exercise 14 and fill in the table together. What things are already going well at school and what can be improved?

Suggested related themes

Theme 1: Solutions to climate change are discussed.

Theme 3 about waste links to plastic waste in the oceans and *The Ocean Cleanup* is discussed in more detail.

Worksheet

[Slide 44]

Complete the worksheet and discuss the answers afterwards. When students have worked together on an exercise, let them present their answers as a group.

Practical assignment

[Slide 45]

Put a message on the school's Facebook or Instagram page. Think about what you want to tell the parents and children. Do you want to tell them about the problems in the ocean or about clean drinking water? Or do you want to make people think about saving water and using it sparingly? Make the message short but powerful and add a good photo. You can also think up a challenge. Let your teacher post it on the school's social media. Note: an alternative is to write a message for the school's newsletter or website.

Closing

[Slide 46]

Discuss the learning goals and agree when and how they can continue working on their practical assignment (message for school's social media). Help the students with the practical assignment.

Outdoor experience

[Slide 47]

Place rainwater barrels and buckets around school to collect rainwater. Use this water in school, for example, to wash your hands or water the plants. How much water can you save?



Extras

[Slides 48 - 52]

Game: Hangman

Exercise 1

Plastic clusters into large quantities in certain parts of the oceans due to the ocean currents. Find out where in the world these places are. Look at a map or draw on a map where these places are.

Exercise 2

We cannot imagine life without water. Draw as many things / moments / places where we use water.

Materials Required

For the Outdoor Experience, rainwater barrels and buckets are required.

For the Extra Exercise 3 you need paper and pencils, pens, or markers.

Theme 5. Water

Answer key - Ages 11-14

Exercise 1

a. What percentage of the Earth's surface is made up of water?

As much as 70% of the Earth's surface consists of water.

Exercise 2

We use the ocean for different purposes, such as pleasure, transportation and food. Give an example of each use.

pleasure: diving, swimming, sailing.

transportation: cargo ships

food: fish, shellfish

Exercise 4

a. What does 'fishing quota' mean?

A fishing quota indicates how much of a certain fish species each country is allowed to catch. In other words, agreements are made about fishing.

Exercise 7

Now you know about our oceans and how to save water at home.

What will your contribution be to help tackle the problems regarding water?

Choose one thing you can do and write down how you will achieve it.

Share what you think is important and what you are going to do. See if there is something that can be improved in the classroom.

