



SPACE

awareness

CONTINENTAL CLIMATE AND OCEANIC CLIMATE

Let's find out that in the summer it is cooler by the sea than on the land
and that water cools off more slowly than soil.

Stephanie O'Neill, Science Foundation Ireland



Curriculum topic

climate/climate change

Big idea of science

Earth is a system of systems which influences and is influenced by life on the planet.

Keywords

Climate, Earth, temperature, continental, oceanic

Age range

6 - 10

Education level

Primary School

Time

45min

Group size

Group

Supervised for safety

None

Cost

Average (5 - 25 EUR)

Location

Indoors (small, e.g. classroom)

Core skills

Asking questions, Planning and carrying out investigations, Analysing and interpreting data, Constructing explanations, Engaging in argument from evidence

Type of learning activity

Partial enquiry

BRIEF DESCRIPTION

This activity proposes different small experiments and discussions to show that in the summer it is cooler by the sea than on the land and that water cools off more slowly than soil.

GOALS

Students measure and compare temperature changes of water and soil to explain the differences between continental climate and oceanic climate.

LEARNING OBJECTIVES

- Students learn that in the summer it is cooler by the sea than on land.
- Students describe why water cools-off more slowly than soil.
- Students use temperature measurements. They learn that different regions in the world experience seasonal weather patterns and that climate can be linked to the environment of an area.

EVALUATION

- Students fill in a worksheet during the activity.
- At the end of the activity, ask the students to explain why it is warmer inland in the summer than on the coast. They can draw the experiments conducted and write the conclusions.
- Ask students why the cup of soil was warmer than the cup of water. Ask students which cup would cool down faster if they were both hot.

MATERIALS

- 2 clear plastic cups

- 2 thermometers
- water
- soil
- sunlight
- red, yellow, green and blue colouring pencils
- worksheet PDF

BACKGROUND INFORMATION

The Koppen climate classification system, named after the scientist, was developed in the 19th century and is the most widely used classification system in the world. The system characterises the climate based on the native vegetation of an area. It also takes into account annual and monthly temperatures and precipitation, as well as the seasonality of precipitation.

Continental Climate

In regions with a continental climate, the average temperature is higher than 10°C during the warm periods and below -3°C during the coldest ones. Such regions are usually found in the interiors of continents and are far away from the influence of the ocean or large water surfaces. As soil and rock have a much lower heat capacity than water, they gain and lose heat quickly. Continental climates are often found to be relatively dry and most of the water carried by air masses originating from ocean regions far away is lost as rainfall early in the journey.

Regions of the Earth that have continental climates include Siberia and central Russia, and much of North America. Siberia, Canada and the northern states of the US in particular can exhibit very large differences – up to 40°C – between summertime and wintertime average temperatures.

Oceanic climate

Oceanic climate is found along the west coasts at the middle latitudes of all the world's continents like northwest Europe, the Pacific Northwest region of the USA and Canada, or in southeast Australia.

Oceanic climates are characterised by a narrower range of annual temperatures (usually between 0 and 22 °C) than observed in other places at a comparable latitude, and do not have the extremely dry summers of the Mediterranean regions. Precipitations are more dispersed throughout the year.

FULL ACTIVITY DESCRIPTION

Preparation

- For 'Summer and Winter' activity, you will need to draw a table on the board.
- For the activity 'Sea and land' make sure that the water and the soil are at the same temperature. You can do this by measuring the temperature of the soil and bringing the water to the same level. You will also need a source of heat. If the sun isn't shining the day of the experiment, you can use another heat source like a bright lamp kept close to the cups.

The table should be as follows:

Measurement 1 (before exposure to the Sun) Measurement 2 (after exposure to the Sun)
Measurement 3 (15 min. after exposure to the Sun)

Activity 1: Summer and winter

Step 1:

Read students the story from Task 1 on the worksheet or get them to read it themselves.

Step 2:

Ask the students what the story was about. Where did Ella, Alex and their Dad go? How did the sand feel? And the water?

Step 3:

Explain that it is warmer in the middle of the country in the summer than on the coast. In the winter it is warmer on the coast.

Step 4:

Ask the students if they can imagine an experiment to explain why.

Step 5:

The students investigate why it is warmer inland in the summer than on the coast.

Step 6:

Ask the students why they think it is warmer inland than on the coast in the summer.

Activity 2: Sea and land

Step 1:

Explain that you are going to do an experiment. Ask one of the students to help you. Give this student two identical plastic cups.

Step 2:

The student half fills one cup with soil and the other with water.

Step 3:

Ask the students which cup represents the coast? And the middle of the country?

Step 4:

Explain that the cup with soil represents the inland climate and the cup with water represents the climate on the coast.

Step 5:

Put a thermometer into each cup (do not stick it too deeply into the soil).

Step 6:

Remove the thermometers after one minute and read the temperatures together. Explain how if necessary. Write the temperature readings in the table on the board.

Step 7:

For Task 2a ask the students to draw a red circle around the cup that they think will be warmer after the cups have been standing in direct sunlight.

Step 8:

Now expose the cups to direct sunlight for five minutes.

Step 9:

Put a thermometer in each cup. After one minute, help the students read the temperature on each thermometer.

Step 10:

Take the cups out of the sun. After 15 minutes, measure the temperatures of the contents of the cups again.

Tip: Ensure that the students know how to read a thermometer before beginning the Sea and land activity.

Step 11:

Write the temperatures for the soil and the water in the table. Look at the answers together. Which cup became warmer in the sun?

Step 12:

The students use a yellow pencil for Task 2b on the worksheet. After 15 minutes, the students complete Task 2c. Did the students draw a circle around the same cup for Tasks 2a, 2b, and 2c? Encourage the students to explain their choices.

Activity 3: Warm soil, cold soil

Step 1:

Discuss why the cup of soil became warmer than the cup of water. Why do the students think this happened?

Step 2:

Explain that this is because the rays of the Sun penetrate deeper into the water than into the land. Therefore, they warm a much larger volume of water. The rays of sunlight on the land do not penetrate much below the surface. This means that only the surface of the land is warm. The surface of the land is warmer than the water as a whole; however, since a smaller volume of land is heated, the land also cools down more quickly.

Step 3:

Explain the results of the experiment to the students again by asking them if they have ever dug a deep hole when they were on the beach. What did they notice?

Step 4:

Come to the conclusion that the deeper you dig, the colder the sand is. That is because the sunlight is unable to penetrate beyond the top layer of the sand. So the surface gets very hot, but below this it stays cool.

Step 5:

Explain that the soil (the land) warms up very quickly, but also cools down quickly. The water (the sea) warms up more slowly, and takes longer to cool down. That is why in summer it is cooler on the coast than inland, and in winter it is warmer on the coast.

Step 6:

For Task 3 on the worksheet, the students colour the areas where it is warmest and coldest.

CURRICULUM

Space Awareness curricula topics (EU and South Africa)

Our fragile planet, climate/climate change

National Curricula

UK, KS1: Year 2, maths: measurement UK, KS1, geography: human and physical geography UK, KS1, geography: locational knowledge

CONCLUSION

This activity introduces primary school students to the difference between continental and oceanic climates by showing that in the summer it is cooler by the sea than on the land and that water cools off more slowly than soil.



This resource was selected and revised by Space Awareness. Space Awareness is funded by the European Commission's Horizon 2020 Programme under grant agreement n° 638653

