



Climate Change and Natural Disasters

TOPIC HEATWAVE

Deliverable: O2/A3: Lesson plans



STEM4CLIM8

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Executive Summary

In a recent OECD survey (OECD- Education and Skills Today 2018), covering 25 European countries, almost all countries report shortfalls of skills that teachers need to meet school needs, combined with difficulties in updating teachers' skills. However, digitisation is expected to profoundly change the way we learn and work. Many children entering school today are likely to end up working in jobs that do not yet exist. Preparing students for these uncharted territories means that we not only have to make sure that they have the right technical capabilities but that we must strengthen their emotional and social skills. Resilience, the individual capacity to overcome adverse circumstances and use them as sources for personal development, lies at the core of being able to successfully adapt to change and thus actively engage with our digital world. At the same time, we need to acknowledge Internet addiction and behaviours at risk of IAB (Internet Addiction Behaviour) as emerging problems for our youth. A STEM approach bridging physical computing with environmental consciousness while focusing on off-screen collaborative activities is an excellent way of improving technical capabilities while strengthening emotional and social skills.

STEM4CLIM8 has as primary objective to produce approaches and tools to help those working with children reach out to them with a view to help them engage with programming and develop STEM related skills. It aims to achieve this not by increasing screen time but by encouraging hands on play through the creation of a custom virtual world using Minecraft modding and the execution of missions dealing with natural disasters and using physical computing blocks which will be programmed to interact with the virtual world through the Raspberry GPIO. The missions will reveal the science behind natural phenomena frequently associated to climate change and inspire environmental consciousness while at the same time enhance STEM skills.

Reference:

*OECD- Education and Skills Today, Succeeding with resilience-Lessons for schools, January 29, 2018, Retrieved February 18, 2021 from: <https://oecdutoday.com/succeeding-with-resilience-lessons-for-schools/>

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1. Introduction

1.1 Brief Description

This lesson aims to support and enhance classroom lectures on topic of heatwaves as a natural disaster and its relationship with climate change. The goal is to raise awareness and educate on preparedness for heatwaves, which can reduce its disruptive impacts on communities.

2. Lesson Information

2.1 Main Subject Domain

Environmental Education, Earth Sciences

2.2 Connection to the science curriculum:

Country	Grade(s)	Unit(s)	Main Objectives
Portugal	7	Earth Transformation	in Consequences of Earth's internal dynamics

2.3 Connection to other subject domains:

Geography, Biology, Life Sciences

2.4 Keywords

Heatwaves, Natural Disasters, Climate Change

2.5 Age Range / Grade Level

Grade 5-7

2.6 Didactical Hours:

120 minutes (3 40-minute lessons)

2.7 Learning Objectives and Expected Outcomes

Students will learn about:

- how heatwaves occur and its connection with climate change
- how extreme weather events such as heat waves affect the population.
- how different places have adapted to heat and to how adapt their surroundings to heat.
- How to Develop an awareness of health risk in extreme heat.
- How to Identify threats of extreme heat to the environment, such as wildfires and draughts.

2.8 Main Skills involved / acquired competences:

Students during this lesson will demonstrate the following 21st Century Skills:

- Information Literacy: Students will be using digital databases to gather further information on the frequency and intensiveness of heatwaves and relate it to climate change.
- Media Literacy: Students will use the console and Minecraft world to explore the heatwave scenario and its consequences.
- Communication and Collaboration: students will work in groups to do activities.
- Creativity and Innovation will also be key in performing the missions in Minecraft.

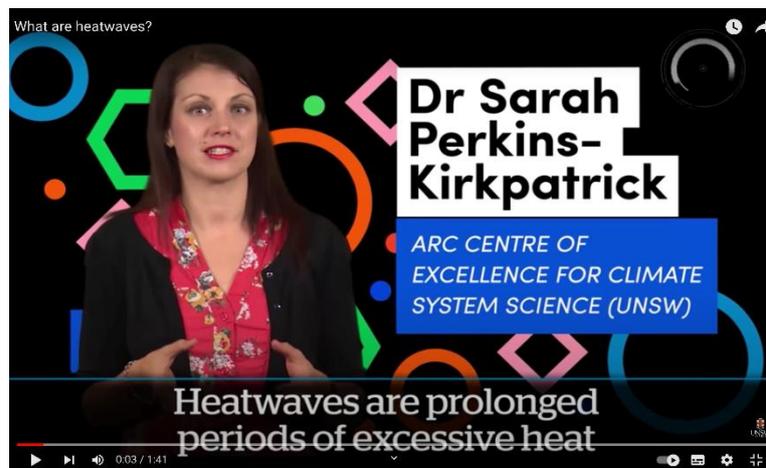
3. Lesson Contents

3.1 Lesson Procedure

In this lesson, students then will perform activities to investigate the frequency of heatwaves in their locations, and the effects of heatwaves on living beings.

Start by sharing this video with your students:

<https://www.youtube.com/watch?v=zWhOsysrLfg>



Ask them some questions in order to measure their prior knowledge and to reveal their alternative conceptions, if any:

- What is a heatwave?
- Where and when do heatwaves happen?
- Are heatwaves becoming more common?

One of the purposes to ask these questions is to reveal their alternative conceptions about heatwaves. One of the most common is that heatwaves are likely to happen only on tropical countries, or during summertime.

Ask them to look for information (on a local library, newspapers, or the internet) if your area has been affected by heatwaves recently, and their consequences such as fires, draughts, and casualties.

At this step, different activities can be undertaken with the students so they can begin to explore heatwaves and apply what they have learned. These activities are differentiated to challenge students using a different learning style.

Activity 1: Heatwaves in your area

Although there is no consensus of criteria defining a heatwave, the World Meteorological Organization defines it as "five or more consecutive days during which the daily maximum temperature surpasses the average maximum temperature by 5 °C.

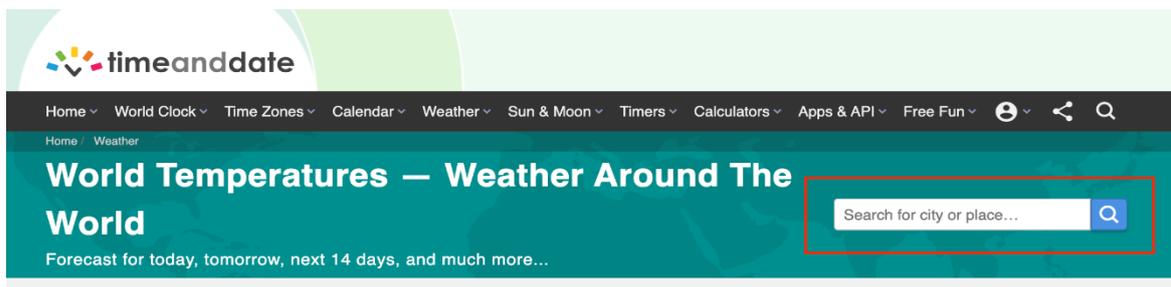
In this activity, your students will use a website to investigate when heatwaves have occurred in your area.

Materials Needed: Computer with internet access.

Procedure:

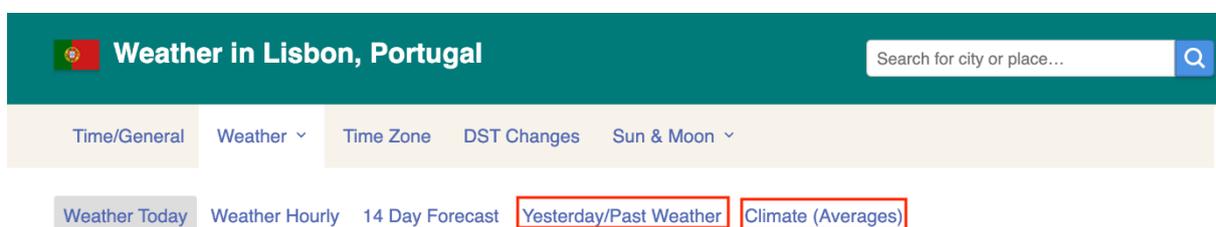
timeanddate.com is a website that brings a lot of information about astronomical and meteorological events. One of the sections of the website contains detailed weather measurements since 2009.

Visit <https://www.timeanddate.com/weather/> and type the name of your location on the search bar. If you cannot find your location, choose a larger town nearby.



First, ask your students to record the average maximum temperatures for each month of the year. This can be done by selecting "Climate (Averages)".

Then, ask them to investigate the maximum temperatures in the past months and identify if any heatwaves occurred. For this, they can use the "Yesterday/Past Weather" option.

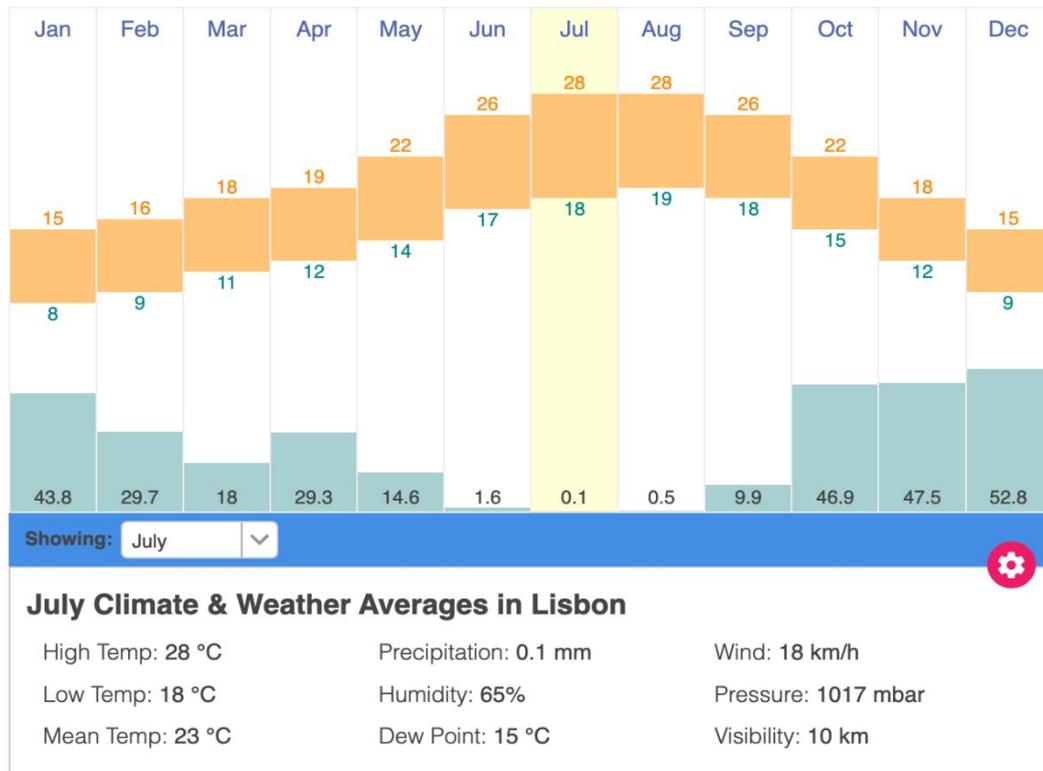


As an example, let's consider the weather in Lisbon during the month of July. Timeanddate.com shows us that the average maximum temperature for this month is 28 °C. Therefore, students will need to identify any 5-day stretch of maximum temperatures 33 °C or higher.

Annual Weather Averages Near Lisbon

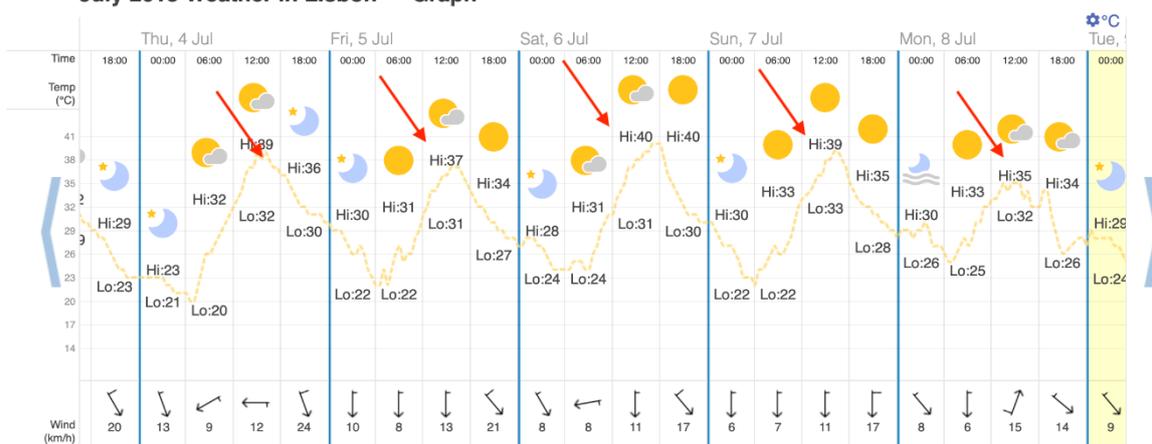
Averages are for Lisbon Portela Airport, which is 5 kilometers from Lisbon.

Based on weather reports collected during 1985–2015.



It's easier to select full months and look at the daily temperature graphs. In our example, we see that in July 2013 there was a heatwave with 7 consecutive days of maximum temperatures 33 °C or higher.

July 2013 Weather in Lisbon — Graph



This activity is better carried out if students can work in pairs or groups to speed up the research. You can assign a specific month for each group, for instance.

After the investigation is complete, make the students present the results about their specific months to their colleagues. Try to identify if heatwaves have become more frequent during the past years.

Activity 2: Simulating a heatwave

In this experiment, students will simulate a heatwave in a confined space and investigate the effect of the prolonged high temperatures in a plant. They will also study the effect of different building materials in the temperature conditions.

Materials Needed:

- small potted-plants, preferably lush and green when you begin the experiment.
- boxes to cover the plants from different materials (cardboard, wood, styrofoam, glass).
- black and white paint.
- aluminium foil (the one used for cooking).
- thermometer to measure the temperature inside and outside the boxes

Procedure:

Divide the students in pairs or groups. Each group will use a box of a different material. Students can also have several boxes of the same material but painted with different colours (black or white) or covered with aluminium foil. It is important to use the same type of plant on all groups.



Place the plant in a sunny location (e.g. on a window sill or outside). Place the thermometer next to the plant, but not on the ground. Cover the plant completely with the box.

On each day, check and record the temperature in the box. Once the temperature reaches a consistent high point for a few days, you have created heatwave-like conditions within the box. Conduct regular temperature checks and observations to see how the conditions affect the plant.

As you conduct the experiment, record your observations and answer the following questions.

- explain your procedure
- how does the experiment recreate heatwave conditions
- what was the temperature in the box and how long it took to reach it
- describe what happened to the plant

After a week or two of experiments, make the groups present their results to their colleagues. Let them discuss what was the effect of the different materials in the conditions inside the boxes.

Activity 3: Heatwave in Minecraft

Materials Needed:

- STEM4CLIM8 Console
- Minecraft Education Edition
- STEM4CLIM8 "Amareleja" Minecraft Education World

This world targets to instruct students about heatwaves and how to be prepared.



Please follow the instructions described in the "STEM4CLIM8 Minecraft Worlds Scenario and Tips for Educators" document.

3.2 Questions/Assignments

After performing the activities, you may ask some of the following questions:

- What is a heatwave?
- Where and when do heatwaves happen?
- Are heatwaves becoming more common?
- What are the effects of heatwaves in living beings and the environment?
- How can we mitigate some of these effects?

3.3 Learning Variabilities

Visual impaired students will benefit if they have access to audio descriptions of the images presented during the activities.

3.4 Assessment and Evaluation

Teachers can assess the student's achievements in multiple ways. In addition to quizzes about the lesson's contents, teachers can also include the participation in the practical activities, and creativity in completing the Minecraft World scenario.

3.5 Links to supportive materials and ICT tools

<https://scijinks.gov/heat/>

<https://www.metoffice.gov.uk/weather/learn-about/weather/types-of-weather/temperature/heatwave>

<https://www.weather.gov/safety/heat-during>