

Teachers' Guidelines

Title of the package: Climate of the Arctic

Information about the package:

Brief Description:

The Arctic has a cold climate. This is mainly because the earth's axis is tilted relative to the sun and less solar energy reaches the polar regions. In addition, the Arctic is covered with snow and ice much of the year. Snow and ice have high reflectivity, albedo, which helps keep the Arctic cool. Although the Arctic may seem far removed from the rest of the globe, Arctic climate and weather are closely linked with climate and weather elsewhere. Cold conditions in the Arctic help to drive global circulation patterns in the atmosphere and ocean. Those circulation patterns in turn affect climate and weather phenomena at lower latitudes, such as heatwaves, cold snaps, storms, floods, and droughts. At the same time, the Arctic's location and configuration creates phenomena rarely found elsewhere. The Arctic region is undergoing rapid climate change. At the Polish Polar Station Hornsund over the last 40 years temperatures have increased by 4.5 degrees Celsius - six times above-average global warming. The increasing air temperatures go hand-in-hand with the decline of the Arctic sea-ice extent. Using this work package you will learn more about the climate of the Arctic.

How does the package relate to STEAM education: The thematic scope of the package is science-centered and includes recognition and inquiry activities. The package mainly focuses on Arctic climate and meteorological measurements.

Keywords: Arctic, Svalbard, climate, climate change, meteorology, WMO, clouds, global temperature.

Age Range: 14-18

Didactical Hours: 2-3 hours.

Learning objectives:

The student will:

- understand what characterizes the climate of the Arctic;
- know the difference between climate and weather;
- know the meteorological equipment used to find the state of the atmosphere at a given time;
- learn about scientific evidence for warming of the climate system;
- learn what causes climate change;

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EDU-ARCTIC 2: from polar research to scientific passion - innovative nature education in Poland and Norway receives a grant of ca. 240 000 EUR received from Iceland, Liechtenstein and Norway under EEA funds. The purpose of the EDU-ARCTIC 2 project is to: enhance the knowledge about nature, geography, natural resources, political specificities concerning polar regions and increase awareness of environmental issues and climate change, increase of interest in pursuing STEM education and careers due to enhancement of knowledge about scientific research, and their place in the modern world, familiarizing young people with scientific career opportunities; introduce innovative tools by way of an e-learning portal and effective methods of teaching science in schools.

Link to the package: <https://graasp.eu/spaces/6102863eaa5af6346d276ac8>

We encourage teachers to copy the graasp package to their own graasp space in order to become “owner” and be able to modify the content, hide or unhide some materials, add quizzes etc. Moreover, teachers may share the package with their students and check the progress of each student.

A short video tutorial on how to do it is available at:

<https://view.genial.ly/5f7ef81f1b2b330d2efa3411/video-presentation-tutorial-graasp>

If you don't have access to the graasp package, contact us: edukacja@igf.edu.pl

The package consists of 4 sections described in detail below. In the end, there is a short quiz summarizing the knowledge.

1. Climate - introduction

First, introduce the students to the factors shaping the climate of the Arctic using ppt presentation. Then ask the students to fill in the blanks in the interactive application “Climate vs. Weather”. Then watch the documentary “ICE MOTION”. Then test students' knowledge of clouds and aerosols by playing quiz. At the end watch the short animation on WMO before going to the second part of the work package.

Suggested resources:

- PPT presentation on Climate of the Arctic
<https://graasp.eu/resources/61093654650198e87d55d43b>
- Fill in the Blanks - interactive game
<https://graasp.eu/applications/610d4eff9b1b9c07d3aa83d6>
- Videos on YouTube: https://www.youtube.com/watch?v=tOR_qaG9vIk&t=41s and <https://www.youtube.com/watch?v=wIVHZocXE0M>
- Quiz: <https://climate.nasa.gov/quizzes/clouds-aerosols-quiz/>

Estimated time: 25 minutes

2. Meteorology in the Arctic

A meteorologist uses scientific principles to understand, explain, observe or forecast the Earth's atmospheric phenomena and/or how the atmosphere affects the Earth and life on the planet. A climatologist studies weather conditions averaged over a long period of time. Meteorological instruments or W\weather instruments are the equipment used to find the state of the atmosphere at a given time. Discover why the world needs meteorologists by watching the video. Then teach the students about the meteorological measurements and equipment by simply using the provided presentation. Then let the students play a memory game on meteorological instruments - Connect devices with their measurements.

To summarize this section, ask your students to discuss what is their opinion on the importance of meteorological studies.

Suggested resources:

- Video on YouTube <https://www.youtube.com/watch?v=QECiYoiaFY>
- Presentation on meteorological measurements
<https://graasp.eu/resources/610d5914d8ec2f1a647dc92e>
- Memory game https://www.educaplay.com/learning-resources/10001360-meteorological_instrumentation.html

Estimated time: 20 minutes

3. Climate change in the Arctic

In this section, students will learn about climate and its change in the Arctic. Watch the videos “Arctic Report Card 2020” <https://www.youtube.com/watch?v=TcfQiKUKgBY&t=30s> and “The Arctic: a delicate icy ecosystem” <https://www.youtube.com/watch?v=V4lwQcho1No> Then using the provided ppt presentation <https://graasp.eu/resources/610d5ef8d8ec2f1a647dccb4> show the evidence on climate change at the meteorological station Hornsund in SW Spitsbergen, where collected data series reflects the rapid environmental changes. You can also read a short note <https://scienceinpoland.pap.pl/en/node/82060>

Then discuss what causes climate change by using provided gif <https://graasp.eu/resources/610d631a4e820b228b3c6e7c> and check what evidence for warming of the climate system is given by the scientists <https://climate.nasa.gov/evidence/>

Suggested resources:

- Videos on YouTube: “Arctic Report Card 2020” <https://www.youtube.com/watch?v=TcfQiKUKgBY&t=30s> and “The Arctic: a delicate icy ecosystem” <https://www.youtube.com/watch?v=V4lwQcho1No>
- Ppt presentation <https://graasp.eu/resources/610d5ef8d8ec2f1a647dccb4>
- Short scientific communication: <https://scienceinpoland.pap.pl/en/node/82060>
- Meteorological bulletins from the Hornsund station: <https://hornsund.igf.edu.pl/Biuletyny/>
- Global climate change evidence provided by NASA: <https://climate.nasa.gov/evidence/>

Estimated time: 25-30 minutes

4. Summary quiz

Check the students' knowledge by a quiz on global temperature changes: <https://climate.nasa.gov/quizzes/global-temp-quiz/>