

Glacier – basic package

Guide with lesson plans

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Glaciers – basic package

Guide with lesson plans

“Glaciers – basic package” is aimed at students between 13 and 15 years of age, which is to say at students in lower secondary school and at students of grades 7 and 8 of primary schools depending on the educational system of the country. Some materials from the package may also be used when discussing landscape zones (tundra, ice desert) in the 6th grade of the primary school.

The package can be used during lessons following the core curriculum and also during extracurricular lesson or school trips. In the second case the teacher has more freedom in terms of the amount of time and can devote to the materials included in the package, and combine the package with other materials created as part of the ERIS project (for example, the package entitled “Meteorological measurements in the Arctic”). In the work with talented students, the teacher may use materials from the extended package.

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| Title | GLACIERS – basic package |
| Author | Dr. Jerzy Giżejowski Department of Polar and Marine Research Institute of Geophysics, Polish Academy of Sciences |
| Age of students | 13-15 |
| Stage of education | Lower secondary school / grades 7-8 of primary schools |
| Subject | Geography, Physics |
| Overview of package content | |
| <p>The inhabitants of Greenland, Iceland or Spitsbergen have glaciers within short walking distance of their homes. For people living in the Alps, reaching a glacier takes longer, sometimes many hours. For those inhabiting other areas, glaciers are remote and, as a result, exotic and fascinating. Related to global warming, the problem of glacier and ice cap melting receives a lot of media attention, which further increases people’s interest in the topic.</p> <p>The purpose of this package is to provide an extension to the information on glaciers which is available in textbooks and to make it easier for teachers to prepare and conduct lessons on the topic. The package includes a general part (theoretical introduction) and a practical part (tasks to be completed by students).</p> | |

There are two multimedia presentations, which explain what glaciers are, the conditions in which they form, geographical characteristics of where they occur, and the mechanism of glacier movement. They also clarify the terms “ablation” and “accumulation”, and provide information on erosion, movement and accumulation, and basic forms of glacial morphology. Moreover, the presentations discuss selected issues in more detail. These include, for example, glacier mass balance, drainage system and cryokarst, glacier movement, calving, charging, glacial and fluvio-glacial erosion and accumulation forms. Both presentations have been created in PowerPoint and come with notes, which are supposed to help the teacher during the presentation stage. The presentations can be edited and adjusted to the interests of particular groups and their current level of knowledge.

Both presentations are also available in the form of videos with a running commentary provided by the author of the package. The videos can be played in class. They can also be used by teachers before the lesson to help them prepare in case they prefer to discuss the topic on their own with the use of the presentation.

The practical part contains tasks to be completed by the students. Each task familiarizes the students with measurement methods applied to various glacial processes and with ways in which the obtained data are processed and used. To complete the tasks, the students need data sets which are either included in the task or can be obtained online from publically available free databases, such as eklima.met.no

An extra advantage of working with the package is the opportunity to familiarize students with the rules they should follow when using scientific databases available online.

Assumed educational aims

The student knows:

- where and why glaciers may form;
- what forms glaciers may take in different morphological conditions;
- what impact climate changes have on glacier development.

The student understands:

- the process of glacier formation;
- the process of glacier ablation (gradual disappearance as a result of, for example, melting) and accumulation (increasing thickness)
- the process by which snow turns into glacial ice;
- processes related to glacier movement.

The student can:

- read hypsometric maps of glaciers;
- draw a morphological cross-section of a glacier on the basis of a map.

Package content

1. "Glaciers" – presentation – basic package;
2. ["Glaciers" – movie based on the presentation](#);
3. ["Glaciers" – animation](#);
4. "Cross-section of a glacier" – task instructions;
5. "Cross-section of a glacier" – worksheet;
6. Hypsometric map for use with the worksheet "Cross-section of a glacier"
7. "Glaciers" – test;
8. "Glaciers" – test – answer key;
9. "Glaciers" – guide with lesson plans.

Supplementary materials

- Blij de H.J., Muller O. 1996. Physical Geography of the Global Environment. John Willey & Sons, Inc. pp. 469-489.
- www.hornsund.igf.edu.pl/en/
- <http://www.kbp.pan.pl>
- Link to online quiz:

<https://play.kahoot.it/#/?quizId=dba85cd3-5477-4ae9-8eff-a23df52f06b7>

Lesson 1

Subject: Drawing a morphological cross-section of a glacier

Lesson plan for “Glaciers – basic package”

Necessary materials and equipment:

- multimedia projector, computer, loudspeakers;
- printed materials for each student:
 - “Cross-section of a glacier” - instructions,
 - “Cross-section of a glacier” - worksheet,
 - Hypsometric map for use with the worksheet “Cross-section of a glacier”;
- pencil and ruler;
- „traffic lights” cards;
- physical map of Europe or the world;
- world atlas;

Lesson aims:

General and specific aims as specified in “Glaciers – basic package”

Methodological suggestions:

- expository methods: lecture, talk;
- demonstration methods: presentation, video;
- activation methods: brainstorming, traffic lights;
- practical methods: worksheets

Lesson procedure:

1. Start of the lesson, organisational activities, checking the register.
2. Information (or reminder) on how to use “traffic lights” cards.
3. Introduction of the topic. The teacher asks the group following questions and moderates the brainstorm:

| Question | Expected answer |
|--|---|
| On what occasion did you receive the information about the phenomenon of glaciers? | <i>Melting glaciers caused by global warming; Ice sheets in Antarctica and Greenland; Sea ice extent in the Arctic; landforms created by the action of glaciers, mountain glaciers, winter sports, etc.</i> |
| Are there any glaciers in the Carpathian Mountains? | <i>No</i> |

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|--|---|
| How does the surface of mountain glaciers and ice sheets change during one year? | <i>Mountain glaciers and ice sheets increase their surface during the winter (in the northern hemisphere - January-February, on the southern - June-July); in turn, in the summer as a result of melting their surface decreases.</i> |
| What is the difference between melting and sublimation? | <i>Melting is a transition from solid to liquid form (eg ice to water), while sublimation is the direct transition from a solid state into a gaseous state, omitting the liquid phase (eg ice into water vapor).</i> |

- Students search for Svalbard Archipelago on the World Map or in the World Atlas and describe its geographical location.

Svalbard Archipelago is located between north Atlantic and the Arctic Ocean. It is situated north of the Arctic Circle, north of mainland Europe about midway between continental Norway and the North Pole. The largest Island of the archipelago is Spitsbergen.

- Students watch the video based on the presentation "Glaciers" (no. 2), in which the presentation comes with a running commentary provided by the author of the package. Throughout the duration of the video, the teacher should monitor to ensure that everything is clear and provide additional explanations whenever necessary.
- The next stage is to complete the tasks in the worksheet. The teacher distributes the materials: "Cross-section of a glacier" - worksheet (no. 5), Hypsometric map for use with the worksheet (no. 6) and task instructions (no. 4). The students familiarize themselves with the instructions and draw a morphological cross-section of a glacier. The teacher monitors and provides support whenever necessary.
- Finally, the students present their work and share impressions regarding the task and its level of challenge.
- To conclude the lesson, the group may complete a test "Glaciers" (no. 7). A possible alternative is to do the quiz in an interactive way with the help of kahoot.it. Follow the link to access the quiz:

<https://play.kahoot.it/#/?quizId=dba85cd3-5477-4ae9-8eff-a23df52f06b7>