

Glacial erratics in Estonia

Compiled by: Jaak Alekand

Objective:

- Participants will learn about and refresh their existing knowledge about the following subjects:
 - 1) ice ages on Earth in the last 2.5 million years;
 - 2) the extent of continental glaciers, the growth of glaciers, and conditions for their movement;
 - 3) the erosive effect of glaciers and their ability to transport rock materials;
 - 4) the origin of glacial erratics in Estonia;
 - 5) igneous rocks: volcanic rocks, plutonic rocks, hypabyssal rocks;
 - 6) sedimentary rocks: clastic, chemical, or organic;
 - 7) metamorphic rocks;
 - 8) causal connections between those subjects.

Target group: high school students

Duration: 1.5 hours

Location: the 1st and 2nd floor exposition at the Ice Age Centre, the rock park of the Ice Age Centre

Tools:

- group study exercise sheets;
- clipboards and a writing instrument;
- rocks at the rock park;
- information stands at the rock park;
- the collection of glacial erratic samples

Activities

Introduction – approx. 10 minutes

The students will be divided into groups during the introduction. They will be acquainted with the programme, area of activities, and schedule. Clipboards, writing instruments, worksheets, and helpful additional materials will be handed out.

1. Discussion of ice age alternation cycles and their effects on the landscape of Northern Europe in the last 2.5 million years – approx. 20 minutes at the Ice Age Centre.

The causes of ice ages. Perennial snow, firn, ice. Conditions for the movement of glaciers. The erosive effects of glaciers. Glaciers' ability to transport rock materials. The destructive effect of glaciers. The mounding effect of glaciers. Glacial sediments.

2. Glacial erratics – approximately 15 minutes at the Ice Age Centre.

The role of glacial erratics as proof of the continental glaciation theory. Determining the movement of continental glaciers with the help of glacial erratics. The biggest boulders in Estonia – mass, volume, and location. The connection between the location and size of the boulders. Boulders in Finland.

3. The most common glacial erratics in Estonia – approximately 20 minutes in the rock park

Group study. The aim is to find the initial location of the rocks exhibited in the rock park and the ways that the rocks were formed. Filling in the worksheet.

4. Rare glacial erratics – approx. 20 minutes in the rock park

Finding the ways that the rock samples in the glacial erratics collection were formed and finding their initial location. Filling in the worksheet.

Conclusion – approx. 10 minutes

The reason behind the large variety of glacial erratics in Estonia. The connections between inanimate nature and living nature. The connections between glacial erratics and human activity.

Correlation with the national curriculum

§ 10. Predominant topics

2) the environment and sustainable development

2.2.4.2. II course “Earth as a System”

Introduction

Learning outcomes

At the end of the course, the student will:

1. describe the spheres of Earth as systems and give examples of the connections between them;
2. analyse the interactions between the natural environment and human activity;
3. describe, in general terms, the development of Earth according to the geochronological scale.

Learning content

Earth as a system. The formation and development of Earth. Geological chronology.

Key concepts: system, open and closed system, geochronological scale.

Lithosphere

Learning outcomes

At the end of the course, the student will:

1. recognise limestone, sandstone, granite, basalt, marble, and gneiss in nature and on pictures, know their most important properties, and give examples of their use;

2. know how to categorise rocks according to how they formed and can explain the rock cycle;
3. describe the internal structure of Earth and compare the continental and oceanic crusts;
4. describe the geological processes near the boundaries of the tectonic plates and hotspot regions;
5. describe the geological processes occurring at certain regions with the help of information sources, connect those with the movement of the tectonic plates;
6. with the help of information sources, describe and compare volcanoes whilst associating their locations with plate tectonics, and their shapes and the nature of the eruption with the properties of magma.

Learning content

The internal structure of Earth and the components of the lithosphere. The classification of rocks according to their formation. Plate tectonics, processes related to the movement of tectonic plates. Volcanism. Earthquakes.

Key concepts: continental and oceanic crusts, lithosphere, asthenosphere, mantle, inner and outer core, minerals, rocks, sedimentary rocks, igneous rocks, metamorphic rocks, rock cycle, mid-ocean ridge, oceanic trench, fold mountain, volcanic island, hot spot, continental rift, magma, lava, stratovolcano, shield volcano, fault, hypocentre, epicentre, seismic waves, the Richter scale, tsunami.

Biosphere

Learning outcomes

At the end of the course, the student will:

1. compare chemical and physical weathering, knows the importance of weathering in nature;
2. describe the soil composition and the formation of soil.

Learning content

Active Study Programmes at the Ice Age Centre 2016

The connections between the climate, flora, and soil. The weathering of rocks. Soil composition and structure, the properties of soil. The factors of soil formation and processes of soil.

Key concepts: biosphere, biome, physical and chemical weathering, parent rock, the mineral sections of soil, humus.