Teachers' Guidelines

Title of the package: Arctic soils and nutrient cycle

Information about the package:

Brief description: The package presents the characteristics of soils occurring in the circumpolar regions, mainly the Arctic, their origins and the circulation of nutrients. The package includes both basic information on soil formation, soil-forming factors as well as the impact of soils on the climate and the development of the organic world of the tundra. The package also contains information beyond the core curriculum that can inspire students not only to deepen their knowledge of the soils in the Arctic, but above all to ask questions and look for less obvious relationships between elements of the natural environment. Students will not only consolidate knowledge about the influence of climate on soil formation, but also look for examples of the influence of soil on the climate.

The package includes a number of activities for the student, the purpose of which is either to introduce the discussed issue or to check how well the student understood the content. Thanks to tasks, quizzes and games, working with the package is an inspiring and interesting journey through the world of arctic soil.

The package also includes references to English sources (English terms, original articles and videos), which makes it a helpful tool in bilingual education.

How does the package relate to STEAM education: The thematic scope of the package is focused on science.

In the field of science, the package covers issues related to soil development, the influence of factors such as climate, living organisms, parent material, topography and time to form soils in the Arctic and the impact of soils on the natural environment.

Keywords: soil, tundra soil, sand, silt, clay, nitrogen, phosphorus, potassium, fungi, fertilizers, ornithogenic soils, little auks, tundra, cryoturbation.

Age: 14-16

Didactical hours: 2 hours + additional time individually devoted by students to completing tasks and exercises (e.g. in the form of homework)

Learning objectives:

Student:

• lists soil components;

• indicates the soil profile of individual soil layers;

• describes the process of soil formation and the impact of soil-forming processes on the intensity of the soil formation process;

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• describes the influence of soils on the natural environment of the Arctic;

• explains the nutrient cycle in the Arctic;

• describes the influence of bird colonies (e.g. little auks) on the formation of ornithogenic soils;

• performs and describes experiments;

• concludes on the basis of conducted experiments.

Content of the package:

Link to the package: https://graasp.eu/s/scbx2u

1.Introduction

1. Soil - a recipe with five ingredients
2. Activity - match the name to the appropriate horizon
3. Presentation - how soils are formed
4. What does the acronym CLORPT stand for?
5. The importance of soils - graphic

2.Inquiry

1. Arctic soils – general characteristics
2. What are other names for these soils – rebus puzzles
3. Matching columns exercise (sentences describing where gelisols can be found)
4. The cycle of nutrients - the film "Nutrient Cycling"
5. Task – answering the questions after the video
6. Task – quiz (are Arctic soils rich or poor)
7. Task - fill in the gaps (are Arctic soils rich or poor)
8. The paradox of arctic soils. Task - mind map.

3. Research

1. Task – quiz (incovering image)
2. Ornithogenic soils - presentation
3. Ornithogenic soils – quiz
4. Task – ornithogenic soils in the Antarctic

4.Activities

1. Layers in arctic soils - photo
2. Layers in arctic soils - quiz
3. Activity - "cryoturbation"
4. Organic matter decomposition - description of the experiment
5. Activity - "Factors limiting the fertility of arctic soils" – TRUE/FALSE quiz, open questions

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6. **Wrap-up**
   1. Things to remember (chosen by students)
   2. Presentation summarizing the topic

Additional resources and links, references:

Definitions from Polarpedia - an online encyclopedia of Arctic knowledge – of terms used in the package:

Little auk https://polarpedia.eu/en/little-auk/

Ornithogenic soils https://polarpedia.eu/en/ornithogenic-soils/

Birds' guano is cooling the Arctic https://polarpedia.eu/en/birds-guano-is-cooling-the-arctic/

Arctic tundra https://polarpedia.eu/en/arctic-tundra/

1. **Videos used in the package:**

– Obieg składników odżywczych – „Nutrient Cycling"
https://www.youtube.com/watch?v=NVhY4ssMtbI&feature=emb_title

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