

Teachers' Card



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General Introduction

The MineralCheck toolkit consists of teaching materials, teaching aids, basic mineral collection and geological investigation kit. The teaching material and assisting materials are designed in such way that allow students to describe the mineral by observation only, so no prior knowledge is required. The basic collection of minerals includes the most common minerals of the Earth's crust and economically interesting minerals. The minerals can be identified by following the described procedure and with the help of the geological investigation kit.

When a student learns the theoretical basics, he describes the mineral and answers the questions in the mineral identification key - MineralCheck. There, by comparing the described properties, student determines a mineral and learns its usefulness to modern society. The MineralCheck toolkit, with which students learn about the properties and use of minerals in a modern society, is the basis for expanding knowledge on the subject of mineral resources.

Key words: *geology, minerals, mineral properties, active learning, hands-on learning*

Extended background information

Minerals surround us in everyday life at every step. Modern society depends on them, as minerals are used to construct buildings and smart devices depend on copper wires to power our homes. Minerals are also necessary for the production of almost every item we use. Mining of mineral resources has gained a negative reputation in the past, but with proper management of excavation and production, it can have minimal impact on the environment and human health. Positive economic impacts, along with socially responsible behaviour of companies, can bring economic and infrastructural development and upscale living standards to the local area.

How come we don't know minerals better? With the MineralCheck toolkit, you will learn how to properly describe the mineral. By identifying with teaching aids and answering questions in the Mineral Identification Key - MineralCheck, you will be able to identify the described mineral and learn about its uses in everyday life.

For more information, see the teacher resource (Handbook).

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Key Competence European Framework

Literacy competence
S1. Ability to understand and interpret concepts, feelings, facts or opinions in oral and written form.
Mathematical competence and competence in science, technology and engineering
S8. Ability to design experimental and observational studies and analyse data resulting from them.
Personal, social and learning to learn competence
S1. Ability to pursue and persist in different kinds of learning.
Citizen competence
S1. Ability to effective interaction with other people
Cultural awareness and expression competence
S1. Awareness of local, national, European culture heritage and their place in the world

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United Nations' Sustainable Development Goals

		Enable access to basic services		Equal access to global expertise
		Safe medical devices		Sustainable urbanization
		Access to education		Responsible consumption and production
		Less hardship, more opportunities		Strengthen resilience, reduce disaster impact
		Safe and affordable water		Reduce marine pollution
		Energy — the golden thread		Sustainable use of terrestrial ecosystems
		Safety of workers and economic growth		Promote peaceful and inclusive societies
		Resilient infrastructure and sustainable industrialization		Better access to technology and innovation

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Contents – Theoretical principles

To determine the properties of minerals, we must first introduce some definitions:

What is a mineral? A mineral is a naturally occurring, homogeneous solid that usually occurs in inorganic precipitation processes. It has a fairly constant but not fixed chemical composition, an ordered crystal structure, certain morphological shapes and properties.

What is a crystal? The crystal is a geometric body with a certain set of surfaces, edges and angles, which is a consequence of an ordered internal structure.

What are mineral resources? Mineral resources are sources of concentration or the occurrence of material that is of substantial economic importance and lies in the earth's crust or at the surface in such form, quality, and quantity that there are possibilities for potential economic exploitation.

The properties of minerals can be generally divided into:

- Properties related to the crystal structure
- Properties based on the interaction of minerals with light
- Mechanical properties
- Properties related to the mass of the mineral
- Other diagnostic properties

Below we provide guidance for school descriptions, which in some cases differ from geological descriptions of the same characteristic. The description of the mineral is adapted to the teaching level at the primary and middle schools. The classification of minerals in the MineralCheck toolkit follows the European Initiative at Mineral Resources. So, the minerals are divided into groups in the way they appear and by their most common use, to:

1. Native minerals
2. Metallic minerals
3. Industrial minerals
4. Precious and semi-precious minerals
5. Construction minerals.

Native minerals are those that occur in nature in a chemically pure way and have a distinct mineral structure. Metallic minerals are those that we use as raw materials in the manufacture of metals. Industrial minerals are those that have a higher economic value and are not metallic minerals. Precious and semi-precious minerals are those that have a high value because of their appearance or rarity and are often used in jewellery. Construction minerals are those that we use as raw materials in the construction of buildings and infrastructure.

Appendix 1 – Properties of minerals

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Lab Procedure/Activity

Minerals surround us at every turn in our daily lives. Modern society depends on them because minerals are used to construct buildings and smart devices. Minerals are necessary to produce almost every item we use. How come we do not know minerals better? Learn to correctly describe the mineral using teaching aids and identify it by answering questions in the Mineral Identification Key – MineralCheck and find out what we use it for in everyday life.

Module 1 – Identification of mineral samples

Learning Pathway

Step 1 - 15 minutes: Teacher makes a brief introduction with a prepared PowerPoint presentation.

Step 2 – 5 minutes: Students are divided into groups (recommended number of students in a group is 3-4). Each group is given three different samples of minerals, Students Card 1, and Appendixes 2, 3 and 4. Optional: appendixes 3 and 4 may also be available on workstations and not every group needs its own.

Step 3 – 25 minutes: Students use the teaching aids and worksheet to identify and write down the properties of minerals (Appendix 2 and 3).

Step 4 – 10 minutes: Students use the Mineral identification key – MineralCheck to determine the name of minerals and their classification (Appendix 4).

Step 5 - 15 minutes: Students search on internet for information on the uses of the minerals and list them. Optional: The teacher starts a competition among the student groups to find as many uses of the mineral in society using the Internet.

Step 6 - 20 minutes: Discuss the uses of the identified minerals. We suggest that identified minerals be associated with some everyday items that contain that mineral.

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Evaluation



The correctness of the identification of the mineral can be checked by the teacher by comparing the described properties of the mineral on the worksheet and the tables of the MineralCheck key (Appendix 2 and Appendix 4).

Questions and answers for basic understanding:

What is a mineral?

A mineral is a naturally occurring, homogeneous solid that usually occurs in inorganic precipitation processes. It has a fairly constant but not fixed chemical composition, an ordered crystal structure, certain morphological shapes and properties.

What are Mineral resources?

Mineral resources are sources of concentration or the occurrence of material that is of substantial economic importance and lies in the earth's crust or at the surface in such form, quality, and quantity that there are possibilities for potential economic exploitation.

Questions and answers from the topic of mineral properties:

Can minerals be identified only by their colour?

No, the colour of minerals is often misleading. The same mineral can have different colours.

When describing minerals, which of the properties is more important: the colour of the mineral or the colour of the mineral streak and why?

The colour of the streak is more important because regardless of the colour of the mineral, the colour of streak line is always the same.

What does the relative hardness of the mineral tell us? Which scale of relative hardness of minerals do you know?

It tells us whether the mineral is harder or softer than the other. The relative strength scale is Mohs's hardness scale.

Suggestions of further activity for advance students:

The students are given the task of finding examples of the use of the minerals described at home. Then, under the guidance of the teacher, the use of the described mineral is presented and discussed.

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Description of Student's Cards

Student's Card 1 - Identification of mineral samples

Supporting materials that need to be distribute to Students before the activity:

Appendix 2 - Worksheet for describing the properties of minerals

Appendix 3 - Teaching aids

Appendix 4: Mineral identification key – MineralCheck

Sources

Books:

- Evolucija Zemlje in geološke značilnosti Slovenije, Herlec, U., in sod. (2009)
- Manual of Mineral Science, Cornelis Klein (2001)

Journals:

- <https://www.mineral-revija.si/>

Web sites:

- <https://mineralseducationcoalition.org/>
- <https://www.mindat.org/>
- <http://webmineral.com/>

YouTube:

- https://www.youtube.com/watch?v=32NG9aeZ7_c
- <https://www.youtube.com/watch?v=QPKkRRdQLFo>