

Soil uneven soil - how to determine soil properties

1	Overall aims: <ul style="list-style-type: none"> • Defining the concepts: soil degradation, indicator plants • Developing the ability to test soil pH • Explaining how soil pH can affect plant growth and development
2	Vocabulary - keywords soil, soil ph, soil degradation
3	Sustainable abilities developed <ul style="list-style-type: none"> • System thinking • Critical thinking • Collaboration competency
4	Pillars of sustainability included <ul style="list-style-type: none"> • socio-cultural • ecological
5	STEAM domains S, E, A
6	Teaching methodologies/activity outline What destroys the soil? - creating a mind map Soil degradation is one of the most serious problems on Earth. Its deteriorating quality is influenced, among others, by intensification of agriculture, development of industry, production of waste and pollution, development of urban areas. The consequences of its pollution are felt not only in the natural environment, but also people pay for them with their health. The following videos can be used as an introduction to the conversation: https://www.youtube.com/watch?v=4YrLZ2s0k3o https://www.youtube.com/watch?v=obyq-9PwOSk



Experiment - testing the Ph of soil

The teacher explains that depending on the place of collection (origin), the soil may have different pH (properties). In order to check the reaction of the soil and whether the soil may actually differ, we will perform an experiment.

Course:

Place about 1 cm³ of the tested soil in a test tube. Add approx. 3 cm³ of water to the test tube. Close the tube with a stopper and shake for a few minutes. Leave the test tube in the stand. After the sediment has settled, dip a universal paper in the solution above the sediment. Take out the piece of paper and read the result on the scale. Repeat with the second soil sample. The test result indicates a slightly alkaline reaction of the test soil (a). You can also carry out such a test with the use of a special plate - acid meter with Hellig's liquid, which is bought in garden stores. Place a small sample of the soil on a plate with a measuring scale, and then mix it with Hellig's liquid. A change in the color of the reagent will indicate the pH of the sample (b).

See: Annex 1

Which soils are the best and which are the worst? - understanding soil properties influencing its agricultural suitability.

The teacher explains that soils have different reactions depending on the parent rock, soil-forming processes and human activity. Carbonate mineral-rich soils are usually alkaline, and soils that are high in organic material are usually acidic. The teacher, using demonstration boards and natural specimens, explains to the children that plants that grow on it can be indicators of soil quality. Taking soil reaction as a criterion, three groups of indicator plants are distinguished: indicators of acidic, alkaline and neutral soils.

- Indicator plants of low pH (acidic) soils are, among others: bilberry, horsetail, field sorrel, heather and various species of violets. Children mark them with red circles.
- The high pH (alkaline reaction) of the substrate is evidenced by the presence of plantain, traveller's chicory, field mustard, white light, field poppy, smoky smoke, and nettle. Children mark them with blue circles.
- In soils with a pH close to neutral, the growth of, among others, purple light, the field speedwell, and the common steak grows. Children place green circles under natural specimens and illustrations.



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Hydrangeas act as a natural pH indicator for the clay-rich soil they grow on - the more acidic the soil, the bluer the flowers are. On more alkaline soils, they take shades of pink and red (pH: 4.5 - intense blue, 5.1 - blue, 5.5 - blue-pink, 6.5 - dark pink, 6.9 - pink, 7.4 - light pink). This does not apply to white-flowered varieties



Experiment

How can I change the pH of the soil? - the teacher explains to the children that acid soil can be influenced by adding an alkaline substance such as calcium oxide. Children perform the experiment.

Course:

To half a teaspoon of acid soil, add a pinch of calcium oxide and mix thoroughly. Examine the pH of the soil mixed with calcium oxide. A comparison of the results of the pH test of samples with universal papers (or Hellig's index) shows that the addition of calcium oxide changes the pH of the soil to more alkaline.

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Expected learning outcomes

The child will be able to:

- express the knowledge about the causes and effects of soil contamination
- know how to reduce soil damage
- plan and carry out soil acidity testing
- explain how soil pH can affect plant growth and development
- give examples of plants and their soil pH requirements



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8	Assessment Summary interview: <ul style="list-style-type: none"> • What have we learned? • What do I already know? • What can I do?
9	Equipment and materials to be used in learning unit (tools, ingredients etc) <ul style="list-style-type: none"> • Test tubes, universal papers, soil samples - garden soil, forest soil, acid soil sample, calcium oxide, distilled water, teaspoon, bulbs and seeds, demonstration boards/ charts with different types of plants, circles in three colors: red, blue, green, large sheet of paper, crayons.
10	Kind of setting - lab, kitchen, outdoor etc. classroom or laboratory
11	References - source: https://www.youtube.com/watch?v=4YrLZ2sOk3o https://www.youtube.com/watch?v=obyq-9PwOSka



Annex 1.

