

**Author**

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Suitable for age/class

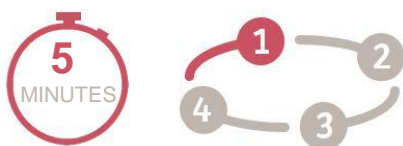
Age 11-14

Time needed

- 45 min + 45 min
- It is followed by autumnal phenological measurements Green-Down (independent observation twice a week)
- 45 min lesson at the end

Settings and requirements

The main part of the lesson takes place in the field - on a place suitable for phenological measurements. The first part of the second lesson can take place in classroom (20 minutes), students then move to school garden. Final lesson takes place in classroom.

**Aim of the activity:**

Introduction to the topic: students record the color change of tree leaves in autumn before the fall off.



Green-Down

Lesson objectives - thematic / content

Students study autumnal changes on tree leaves.

Lesson objectives – inquiry skills

The lesson motivates to the GLOBE long-term measurements. Students form functional, independently working groups. The lesson includes all steps of research cycle. It is a complex long-term project.

1. FIRST LESSON, IN THE FIELD

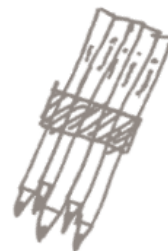
Motivation

Activity description:

- Make your students sit down on the grass so that they have a good view of the landscape. Ask them to spend some time by observing the surroundings.
- Ask a question: *Will the landscape you're just observing stay the same?* In discussion we come to the fact, that the landscape will soon start changing due to the arrival of **autumn**.
- Activity for students: "Tireless pen" (continuous writing) – each student writes continuously for 1 minute words that come to their mind in connection with the word autumn. Students work independently, their pen must not leave the paper, the goal is to write as many words in the given time on the given topic.

You need:

Pens, worksheet, writing pads



**Aim of the activity:**

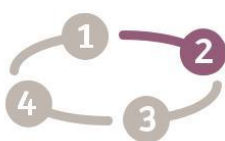
Students focus their attention on autumnal color change of leaves.

**Aim of the activity:**

Students realize what interests them and what they would want to know.

**Aim of the activity:**

Together we choose such a question so that we can continue with the GLOBE autumn activity – Green-Down.

**Aim of the activity:**

Students formulate their hypotheses.

Focusing on the topic

Activity description:

- Ask students to share their "autumn words". Mark the most repeated words. Words as "leaves", "colors", "loss of leaves", "coloration of leaves", etc. should appear frequently (point them out).

Notes:

Work with text from the Motivation Activity.



Asking questions

Activity description:

- Divide students in groups, preferably of 4.
- Ask students to discuss in groups and form scientific questions: what interests them in connection with the color transformation of tree leaves?
- The groups share their questions. Students underline the most important and frequent ones. Help them with the exact wording of the questions and gradually lead them toward the selection of a research question.

You need:

Pens, worksheet, writing pads

Selecting research questions

Activity description:

Familiarize students with the selection criteria of the questions. First of all, they must be verifiable under the given temporal and spatial conditions. In the previous activity there probably appeared these types of questions in the groups:

- Why do tree leaves change color in autumn?*
- Do different tree species change color identically?*
- How do leaves of a particular tree species discolor (common maple, mazzard, etc.)?*
- When do leaves of a particular tree species fall off?*

These are all appropriate questions for further investigation in this lesson. Each student writes down a research question, possibly more questions, in their worksheet.

Notes:

You can leave more questions if they are closely connected and directed toward the activity Green-Down.

You need:

pens, worksheet, writing pads

Formulation of hypotheses

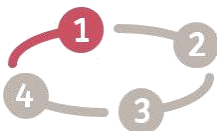
Activity description:

Students formulate a hypothesis for each selected research question. They discuss it in groups and write down the hypotheses.

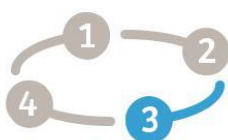
You need:

Pens, worksheet, writing pad



**Aim of the activity:**

Students gain information from a submitted text.

**Aim of the activity:**

Students in groups schedule the experiment so that they can perform phenological measurements Green-Down in the following weeks.



Retrieval of information

Activity description:

Ask students how to find answers to their selected research questions. If more questions are chosen, some answers can be found in literature; to answer other questions, we have to make observations in the field.

For answers to questions like '*Why do tree leaves discolor in autumn?*', offer your students a folding book Phenological Guide. Ask them to find and write down answers.

Notes:

Announce that you schedule field observations for the next lesson to obtain answers to the remaining questions. Assign homework – bring four strings of different colors for a group. They will be needed to mark products of nature.

You need:

Pens, worksheet, writing pads, Phenological Guide

2. SECOND LESSON, FIRST PART - CLASSROOM, SECOND PART – OUTDOORS

Planning, preparation and execution of the experiment or measurement

Activity description:

- Discuss with your students what they would do to get answers to their questions.
- What rules must be observed when exploring* (selection of tree species – habitat, marking of leaves, recording observations – data card, color evaluation – color range, frequency of observation; see GLOBE Teachers Guide)? If some important items are not mentioned by students, guide them with appropriate questions. Record the basic rules together on a flip.
- Students in groups plan the method of observation and record it in their worksheet.
- Students select a tree species on the school garden and mark leaves.
- Students become familiar with how to make records in the data card.
- They carry out the first observation, record the color according to the GLOBE color range (monitor the groups whether they proceed correctly).
- Schedule additional visits on the site.
- Specify safety rules of the visits.
- Inform the students that after the end of their observation, each group will present the results of their work in front of the class and they can collect material for this purpose in the course of the observation (e.g. gather leaves and create a herbarium, take pictures, etc.).

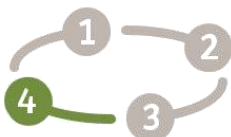
Phenological observation Green-Down follows.

Notes:

Students get answers on the mentioned questions if:

- Each group observes different tree species in the school garden,
- Students observe changing color of leaves and record the date of the fall off,
- Compare their findings at the end.

* At the appropriate time give students data card and color range (see GLOBE Teachers Guide).



Aim of the activity:

Students evaluate the results of the long-term observations and phenological measurements Green-Down.



Aim of the activity:

Students jointly reflect the meaning of their work.



Aim of the activity:

The groups share the results of their work.



You need:

Pens, worksheet, writing pads, GLOBE Teachers Guide (tables for recording observations, GLOBE Plant Color Guide)

3. THIRD LESSON, IN CLASSROOM

Formulation of conclusions and coming back to the hypothesis

Activity description:

- The final lesson will take place after the completion of phenological measurements Green-Down.
- Students in groups return to the worksheet, they search answers to their research questions in the completed data cards, record them in the worksheet and compare them with the hypothesis.

You need:

Pens, worksheet, tables for recording observations, GLOBE Plant Color Guide, material collected during the measurement

Framing

Activity description:

Encourage students to search for the meaning of their work outside school garden, in the school surroundings, in landscape, in Europe, etc. Encourage the discussion by appropriate questions.

You need:

Worksheet



Presentation

Activity description:

Students have 5 minutes to prepare their group presentation, then they present, they have the opportunity to use the material they collected during the observation period. Specify students what should be heard in their presentations: 'What were their research questions?', 'What hypotheses did they come up with?', 'How did the observation go?', 'What conclusions did they reach?' and 'Did they disprove or confirm their hypotheses'.

You need:

Pens, worksheet, tables for recording observations, material collected during the measurement

**Aim of the activity:**

Students formulate more questions that emerged during the lesson.

**Aim of the activity:**

Students evaluate the progress of phenological measurements.



Posing new questions

Activity description:

After the end of the presentations ask students whether they encountered any problems or ambiguity during the measurement; if they still have any questions on the topic. Write the questions on the board and plan how to get them answered (e.g. during measurements next year). Students can search answers to some questions also in their free time.

You need:

Pens, worksheet



Reflection

**Activity description:**

Prepare a questionnaire for students that evaluates individual parts of the lesson:

- What it was like to work in a group, whether they scheduled the experiment correctly, how they proceeded with the measurements, whether they found answers to all their questions, etc.

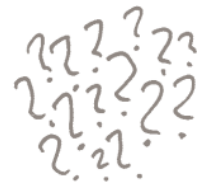
→ Name: _____

→ Tireless pen

What comes to your mind when you hear the word *autumn*? Write continuously words for one minute. Your pen must not leave the paper.



→ Your questions



→ Research questions



→ Hypothesis



→ We found these answers in literature

[

]

→ Schedule of fieldwork



[

]

→ Summary of findings

[



]

→ Which hypotheses did you confirm? And disprove? Comment

[



]

→ Can you think of other questions to the researched topic?
Write them down

[



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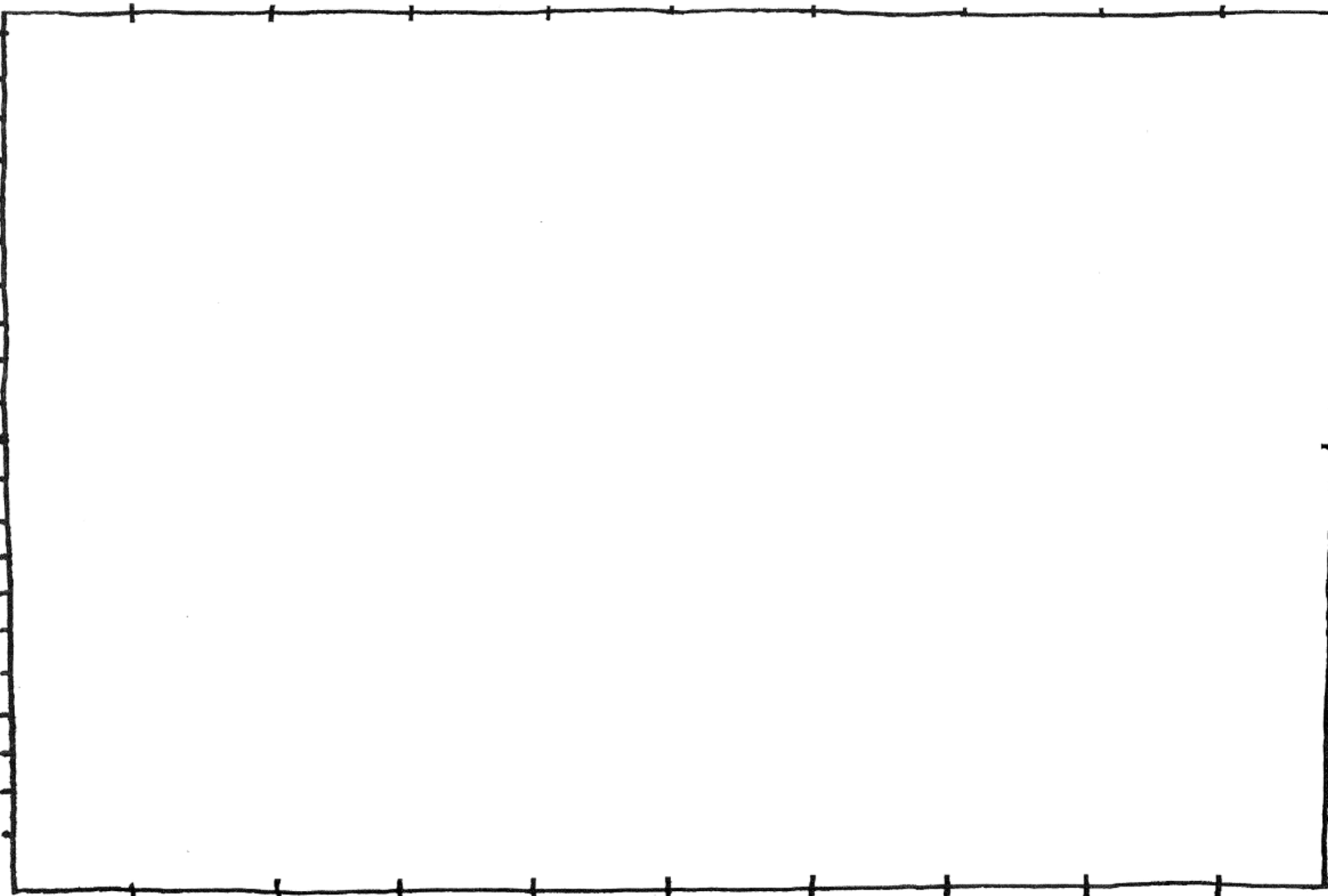
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GRAF ÚSPĚCHŮ A POCITŮ

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Vydala: © TEREZA, 9. ZO ČSOP - sdružení pro ekologickou výchovu, a.ČEZ, a.s., v rámci projektu "Přes tři schody do života aneb co se v mládí naučíš", Praha 1995