MEET THE UNDERGROUND NEIGHBOURS: SOIL BIODIVERSITY

Feedback form link & QR code:
https://ecolise.eu/curiosoil-lesson-plan-form-EN

Subject: **Biology**
Duration: 45 minutes (can be much more if more time is allowed for discussions and digging for soil animals)
Age group: secondary school students (ages 14–16)
Topic: Soil biodiversity and its connection to human life
Connection to Curiosoil tools: -

LEARNING OUTCOMES

Knowledge

- Recall the concept of soil biodiversity and recognize examples of soil organisms shown on the FAO poster (see Lesson 1/Materials) or in soil directly.
- Use identification keys (Soil Animal Days & OPAL chart) to classify 2–3 soil animals from collected samples.
- Compare soil biodiversity across different habitats (e.g., forest, meadow, garden, compost) and discuss factors influencing soil life.
- Generate new questions about soil biodiversity that could guide further inquiry or projects.

Skills

- Show curiosity and engagement when observing soil organisms and discussing their ecological roles.
- Express appreciation for the hidden role of soil biodiversity in ecosystems and human life.
- Reflect on human impacts (positive/negative) on soil biodiversity and suggest ways to protect it (e.g., school garden practices).

Competences

- Handle soil samples carefully, using observation skills to detect small organisms.
- Follow identification procedures with support from keys and peers.
- Accurately identify soil animals and record observations systematically.
- Adjust search and identification strategies when encountering different types of soil organisms.

LEARNING OBJECTIVES ALIGNED WITH SOIL COMPETENCE AREAS

1. Soil functions
Indicators: Students can explain that soil biodiversity supports soil functioning.
Descriptors: Students will understand that soils are dynamic ecosystems regulating natural cycles (nutrients, water, carbon) and supporting aboveground vegetation.

2. Soil diversity
Indicators: Students correctly identify 2–3 soil organisms using the keys and describe their roles in soil ecosystems.
Descriptors: Students recognize soils as diverse habitats hosting organisms with distinct ecological functions (e.g., decomposers, predators, ecosystem engineers).

3. Soil threats

Indicators: Students discuss why some soil samples (e.g., sealed/urban soils) contain fewer or no organisms.
Descriptors: Students understand that some human activities (sealing, pollution, overuse) can threaten soil biodiversity and functioning, reducing soil's ability to sustain ecosystems.

4. Soil solutions
Indicators: Students suggest actions (e.g., composting, school garden practices, avoiding sealing) to protect or improve soil biodiversity.
Descriptors: Students develop awareness of prevention, mitigation, and restoration measures to maintain soil biodiversity, and communicates potential solutions.

LESSON STRUCTURE

Activity 1: Introduction
Duration: 5 minutes

Description
Curiosity activation through poster and initial discussion.

Materials
- FAO poster (digital or print)
Link: https://openknowledge.fao.org/handle/20.500.14283/ca8251en
- projector/smartboard (optional)

Setup instructions
Display or distribute poster.

Step-by-step process
1. Show poster.

2. Teacher asks: "When you hear the word 'soil', what comes to your mind?"

3. Teacher explains that this lesson is about studying soil biodiversity using the poster, soil, and identification keys.

Activity 2: Observation & Questions
Duration: 10 minutes

Description
Students explore the poster in small groups of 2-3 people and note observations. Guiding questions for the students are:
What kind of soil animals do you notice?
What roles of soil biodiversity are highlighted?
Each group notes down 3 observations to share later (see a printable sheet in Annex I).

Materials
- FAO posters (as many copies as there are groups or a big projected image)
- Paper & pencils

Setup instructions
Make sure each group can see the poster.

Step-by-step process
1. Students work in small groups to examine the poster.

2. Students respond to guiding questions (type of animals, role of biodiversity)

Recording
Students write down three observations.

Activity 3: Finding soil animals & identification key practice

Duration
15 minutes (can be much longer)

Description
Hands-on exploration and identification of soil organisms.

Materials
Trays with soil (e.g. dug with a spade or shovel) from different locations (e.g. in a meadow, forest, garden, compost pile).
Identification keys (e.g. Soil Animal Days key, OPAL earthworm chart)
Link for soil animal identification key:
https://bodemdierendagen.nl/en?utm_source=chatgpt.com
Link for earthworm identification key:
https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/SOIL-4pp-chart.pdf?utm_source=chatgpt.com
Magnifying glasses or digital microscope (optional)
Containers for collected soil animals
Camera or smartphone for taking photos of soil animals (optional)
Documentation list (Who found which animal in which soil?, see Annex II)
Paper and pencils
Brush and broom for cleanup

Setup instructions

Gather fresh soil samples from various locations on the morning of the lesson. Usually, a compost pile, forest soil covered with leaves or a covered sandbox is a good start to get lucky. Remember that soil organisms are less active when it is cold. Use a box or bag to transport the soil and ensure that the soil can breathe (do NOT seal air-tight).
Make sure the samples are NOT from protected areas, and you have asked for permission from the owner of the land.
Store the soil in the fridge/a cooler room for up to a few days before your workshop takes place in case you can't collect soil on the morning before the lesson.

Instruct the students to handle soil animals with care and briefly explain how the identification keys work.

Students work in groups of 4–5 (e.g. two small groups from activity 2 join to form a new group) on one tray of soil each. They search for soil animals, magnify (in case magnifying glasses or a microscope are available), identify and note down who found which animal in which tray of soil. Additionally, observations about the behaviour of the respective animals can be mentioned. In case a found animal cannot be identified, allow other forms of documentation (photo, video, drawing) to be added to the documentation list instead.

Remind students to wash their hands after digging in soil.

Step-by-step process
Form groups of 4-5 students
Distribute one tray of soil per group
Students search for soil animals, magnify and identify.

Recording
Students note down their findings on a documentation list (Which group found which animal in which soil, see in Annex II) which can be displayed in the classroom after the lesson. Additionally, photos of soil animals found can be placed next to the list.

Activity 4: Discussion & Reflection

Duration
10 minutes (can be much longer)

Description
Whole-class reflection on findings and connections to ecosystems

Materials
Whiteboard or flipchart (optional)

Setup instructions
Arrange seating for group discussion (optional).

Step-by-step process
Facilitate discussion using guiding questions:

- If you could shrink yourself and live underground, what would you see and experience?
- Which soil animal would you most like to study up close? Why?
- Why do you think soil biodiversity often goes unnoticed or is taken for granted?
- How are humans connected to the hidden world under our feet? (positive/negative actions)
- Which soil (from different locations) was most populated by soil animals and why?
- Which factors influence soil organisms and what could we do to protect them or make their lives easier (e.g. in the school garden)?
- Will we find soil animals below streets, parking lots or other sealed surfaces? What does that mean for soil functioning?
- What new questions do you have after studying soil biodiversity?
- Optionally create a mind map or class poster.

Activity 5: Wrap-Up

Duration
5 minutes

Description
Exit ticket to consolidate learning and provide feedback

Materials
Paper slips/notebook and pencils

Setup instructions
Prepare paper or space in notebooks

Step-by-step process
Students write down:
One new thing I learned about soil biodiversity…
One question I still have…
Collect responses.

Assessment

Formative assessment
- Participation during the poster activity, animal searching and discussion
- Quality of arguments developed during debate
- Collaboration and engagement during group activities

Summative assessment
- Observations regarding the poster
- Documentation list of soil animals found
- Exit ticket

Differentiation strategies

For advanced learners
- Provide additional information and pictures about soil organisms
- Ask them to explain tasks or their additional reading to struggling learners

For struggling learners
- Provide visual aids for soil animal identification
- Pair with more advanced partners during collaborative activities
- Focus on concrete observations rather than abstract connections

For students whose first language is not the language of instruction
- Focus on finding soil animals rather than the identification
- Allow collaboration with bilingual peers
- Offer multilingual resources for extension activities

Extension activities

Immediate extensions
- Rotate groups in Activity 3.
- Go outside and dig out soil together with the whole class or search for soil animals directly outside. Choose together with students where to sample soil.
- Note that soil animals are most active (and found most easily) during the warm season. In winter (cold season), animal activity may be increased by watering pot plant soil or compost with sugar water for several days to weeks.

Home learning
- Look for soil animals at home or on your way back from school.
- Ask a friend, parents or sibling about their knowledge of soil animals and for searching for some.
- Draw your favourite soil animal.

Health and safety considerations
- Ensure soil samples are safe for handling

- Provide hand sanitizer after soil observation activity
- Clear pathways for floor mapping activity to prevent falls
- Monitor group dynamics during debate activities to ensure respectful discourse

Syllabus content reference
This lesson addresses:
- Introduction to soil functioning as influenced by soil animals
- Hands-on observation of soil animals
- Differences in number and diversity of soil animals in different habitats

Teacher's preparation notes

Printing instructions

FAO poster
Link: https://openknowledge.fao.org/handle/20.500.14283/ca8251en
Identification key for soil animals
Link: https://bodemdierendagen.nl/en?utm_source=chatgpt.com
Identification key for earthworms
Link:
https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/SOIL-4pp-chart.pdf?utm_source=chatgpt.com

Instructions for sampling soil

Follow instructions on FAO poster or use a spade or shovel.
Ensure the edges of the newly dug hole are leveled and secure to prevent anyone from tripping or falling in.

MEET THE UNDERGROUND NEIGHBOURS: FAO SOIL BIODIVERSITY POSTER

Explore the poster about soil biodiversity designed by FAO. Work in groups of 2-3 students and write down at least 3 observations! Answer the following guiding questions:

What kind of soil animals do you notice?
What roles of soil biodiversity are highlighted?

Printable material
Who found which animal in which soil?

Name (student)	Name (animal)	Soil location	Observations about behaviour