SOIL SCIENCE LESSON PLAN FOR PRIMARY EDUCATION

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

Subject
Science/Environmental Studies
Duration
2 hours (120 minutes)
Age group
Primary (8–11)
Topic
Understanding our soil - functions, diversity, health and solutions

Learning outcomes

Knowledge
By the end of this lesson, students will know:
- The basic functions of soil in our/the environment.
- Different types of soil and their characteristics.
- The different threats soil faces.
- Simple solutions to protect and improve soil health.

Skills
Students will be able to:
- Observe and describe different soil samples.
- Conduct simple soil investigations.
- Compare characteristics of different soil samples
- Record observations using scientific vocabulary.
- Work collaboratively in groups.

Competences
Students will develop:
- Scientific inquiry skills through hands-on exploration and testing.
- Critical thinking about environmental issues and soil data sources.
- Communication skills through discussion and presentation.
- Environmental stewardship awareness.

- Problem-solving abilities.

Learning objectives aligned with soil competence areas

1. Soil functions
Indicators:
- Students can identify at least 3 main functions of soil
- Students can explain how soil supports plant growth
- Students can describe soil's role in water filtration

Descriptors:
- Recognizes soil as a living system that supports life
- Understands soil's role in food, timber and other goods production/provision
- Identifies soil's function in storing and filtering water
- Explains how soil provides habitat for organisms

2. Soil diversity
Indicators:
- Students can distinguish between different soil samples and materials that are not part of soil and can harm the organisms.
- Students can identify characteristics of sandy, clay, and loamy soils
- Students can explain why different soils are found in different places

Descriptors:
- Observes and compares texture, colour, and the horizon composition of soil samples/monoliths
- Understands that soil varies based on climate and location
- Recognizes the relationship between soil characteristics and plant growth
- Identifies local soil characteristics

3. Soil threats
Indicators:

- Students can name at least 3 threats to soil functioning
- Students can identify how selected soil threats look like in the field

Descriptors:
- Recognizes indicators of soil health (organisms, structure, nutrients)
- Identifies threats such as erosion, pollution, and compaction
- Understands the impact of farming practices on soil
- Connects human activities to soil degradation

4. Soil solutions
Indicators:
- Students can suggest practical ways to protect soil
- Students can describe soil conservation methods and best management practices in function of ecosystem type
- Students can propose actions they can take to protect soil from (further if any) degradation

Descriptors:
- Suggests methods like composting, reduced tillage, and plant cover during most of the year
- Understands the importance of plant cover for soil protection
- Proposes individual and community actions for soil conservation
- Connects soil protection to sustainable living

LESSON STRUCTURE

Please note that the designated times are only indications and are rather tight, they do not allow for longer discussions. Much more time can be spent on further questions or simply just enjoying the wonders of soil.

Try out the suggested experiments on your own before doing them with your students. The type of soil and other substrates chosen can greatly influence the results of experiments, depending on your specific conditions. You may need to adapt the experiments or choose different substrates based on what's available to you – soils are very diverse!

PHASE 1: INTRODUCTION AND ENGAGEMENT (20 MINUTES)

1.1. Hook activity: "What's under our feet?" mystery box exploration

Description
Students explore different soil samples through touch, smell, and limited sight to build excitement and wonder about the topic.

Materials
- 4-5 opaque boxes or cloth bags with drawstring tops
- Soil samples from different land uses (garden, forest, agriculture, urban)
- Hand wipes or access to hand washing
- Clipboards and paper for initial observations
- Timer

Setup instructions

Place each soil sample in a separate mystery box, ensuring boxes are identical from the outside. Ensure all soil samples are clean and safe for handling (no harmful materials, chemicals, or sharp objects). Arrange boxes around the classroom with enough space for small groups. Provide simple observation sheets with prompts like "How does it feel?", "What do you think it is?", "Where might you find this?", “What does soil consist of?“, “What is not part of soil?“

Step-by-step process

1. Introduction (3 minutes)

Gather students in a circle. Introduce the mystery: "Today we're going to be soil detectives! There are mysterious samples hidden in these boxes, and your job is to use your senses to figure out what they are."
Establish safety rules: "We'll only use our hands to explore, and we'll wash hands after each station."

2. Exploration rounds (12 minutes)
Round structure: 2 minutes per station + 30 seconds transition time
Group formation: Divide class into 5 small groups (4-5 students each)
Exploration protocol: Students take turns putting hands in boxes. They feel the texture, weight, temperature. They whisper observations to group members. They record initial guesses and descriptions.

3. Observation recording (3 minutes)
Each group quickly records their findings:
Texture words: rough, smooth, gritty, sticky, crumbly
Visual clues (if any particles stick to hands): colour, size and type of particles
Predictions: What do you think this material is?
Location guesses: Where would you find this in nature?

4. Big reveal (2 minutes)
Dramatically reveal each sample one by one. Allow students to now see what they were touching. Celebrate correct guesses and interesting observations. Build excitement: "These are all different types of SOIL! And today we're going to become soil experts!"

Differentiation strategies
For tactile-sensitive students: Provide plastic gloves or allow them to use tools instead of direct hand contact.
For visual learners: Allow brief glimpses into boxes before full exploration.
For students whose first language is not the language of instruction: Provide texture vocabulary cards with pictures.
For advanced learners: Challenge them to identify specific soil components (sand grains, remains from dead plants and insects).

1.2. Prior knowledge assessment: KWL (Know, Want to Know, Learned) chart creation (20 minutes)

Description
This activity helps teachers understand students' existing knowledge about soil while identifying areas of interest and misconceptions. It creates a visual learning journey that students can reference throughout the lesson.

Materials
- Large chart paper or interactive whiteboard
- Coloured markers or digital pens
- Sticky notes (3 different colours)

- Individual KWL worksheets as backup
- Timer
- Camera or phone to document charts for future reference

Setup instructions
Create a large three-column chart with headers:
K - What we KNOW about soil
W - What we WANT to know about soil
L - What we LEARNED about soil (to be completed later)

Ensure all students can see and contribute to the chart. Give each student 3-4 sticky notes in different colours (one colour per column).

Step-by-step process
Step 1: Individual reflection (3 minutes)
Silent think time: Students individually write or draw what they already know about soil
Prompting questions:
"What is soil?"
"Where do we find soil?"
"What lives in soil?"
"How do we use soil?"
“What do you associate with soil?”
“What comes to your mind when you think of soil or look at/smell/feel it? (provide either a photo or some soil)

Recording
One idea per sticky note, using pictures and words.

Step 2: "K" Column - What we KNOW (8 minutes)

Students take turns sharing one thing they know about soil.

Teacher role: Write responses on chart without correcting misconceptions yet. Ask follow-up questions: "Can you tell us more about that?"; "Where did you learn that?". Group similar ideas together.

Common student responses to expect:
"Plants grow in soil", "Worms live in soil", "Soil is brown/black", "We dig in soil", "Soil gets muddy when wet"

Documentation strategy: Use different colours or symbols to mark:
- Accurate knowledge (green)
- Uncertain/needs clarification (yellow)
-Misconceptions to address (red - but don't mark these in front of students)

Step 3: "W" Column - What we WANT to know (6 minutes)
Question generation: Encourage students to ask questions about soil

Prompting questions:
"What are you curious about after our mystery box activity?"; "What questions do you have about soil?"; "What would you like to investigate?"

Typical student questions:
"How deep does soil go?"; "What makes soil different colours?"; "How do worms help soil?"; "Can soil be sick?"; "How is soil made?"

Teacher strategy: Put a star next to questions that align with lesson objectives to highlight priority learning goals.

Step 4: Learning goals connection (3 minutes)

Briefly introduce the lesson's main goals using student-friendly language. Show students how their questions connect to what they'll be learning. Build engagement by saying: "Great news! Today's lesson will help us answer many of these questions!"

Assess prior knowledge:
- What concepts can we build upon?
- What incorrect ideas need gentle correction?
- What fundamental concepts are missing?
- What aspects of soil science most engage these students?
- What scientific terms do students already use?

During-lesson use of KWL chart
Return to chart throughout lesson to connect new learning. Check off questions as they're answered during activities. Add new terms learned to appropriate sections. Gently revisit and correct initial misconceptions with evidence.

End-of-lesson completion
Students add what they learned to the “L” column, using evidence from activities. Celebrate questions that were answered and identify remaining curiosities. Compare initial "K" column with final "L" column to show learning progress. Identify remaining "W" questions for potential extension activities.

Follow-up documentation
- Take pictures of completed KWL charts for student portfolios.
- Provide take-home versions for students to share with families.
- Use data to inform future soil science lessons and assess curriculum effectiveness.
- Prompt reflection: “How did your thinking about soil change during our lesson?"
“What was most exciting for you today?” “What was new to you?” “What would you tell a friend about this lesson?”

PHASE 2: SOIL FUNCTIONS EXPLORATION (25 MINUTES)

2.1. Soil function stations

Description
This activity provides concrete evidence of how soil supports life on Earth.

- Station 1: Plant growth demonstration

Learning outcomes
- Students observe that soil provides essential nutrients for plant growth
- Understanding that plants struggle in nutrient-poor environments
- Recognition of soil's role in root support and anchoring
- Introduction to the concept of soil fertility

Materials
- 3 transparent containers (identical size)
Make sure that water can drain/ there are holes in the bottom.
If you plant seeds close to the transparent wall, you will be able to observe not only aboveground plant growth but also the roots. Students can design a cover for the containers so that it is dark in the container to imitate "real" conditions in soil (where it is dark). An adhesive strap can be used to allow taking on and off the cover multiple times.
- Seeds that germinate quickly (cress, mung beans, radish, sunflowers, maize or cereals)
- Different growing media:
  - Container A: Rich potting soil
  - Container B: Sand only
  - Container C: Mixture of layers of sand and potting soil chosen by the students
- Water spray bottles
- Pre-grown examples showing different growth stages
- Magnifying glasses
- Recording sheets with plant observation charts
- Measuring rulers
- Labels for containers

Setup instructions
Set up identical experiments 1-2 weeks prior to show growth results. Prepare containers for students to plant during the lesson. Arrange pre-grown examples showing clear differences in plant health. Provide magnifying glasses and measuring tools at the station.

Keep in mind: The difference will most likely only appear after several weeks. Growth might be even faster in the sandy soil because there is more air, and roots can penetrate the matrix more easily.

If you want to test how plants will behave under drought stress (when you stop watering), the difference will become more obvious.

Step-by-step process
Part A: Observation of pre-grown plants (3 minutes)

Students examine three plant samples grown in different media.

Guided questions:
- "Which plants look healthiest? Why do you think that is?"
- "What differences do you notice in the roots?"
- "How tall are the plants in each container?" – but consider: the tallest plants might not be the healthiest, they might have been “craving” for light.

Recording
Students sketch observations and note differences.

Part B: Setting up new experiment (4 minutes)

Student role: Each group plants seeds in all three growing media.

Process
1. Label containers clearly.
2. Add growing medium to each container.
3. Plant 5-6 seeds in each container at same depth. Plant small seeds closer to the surface and larger seeds a bit deeper. Rule of thumb: the depth at sowing is roughly equal to the dimension of the seed itself.
4. Water equally with spray bottles. Students can also use a watering can when the plants grow bigger. Practical tip: Make sure that students pour the water out slowly and evenly onto the entire surface of the container (instead of creating a hole in the soil with the water).
5. Place in same location for equal light exposure.

Students predict which plants will grow best and explain their reasoning.

- Station 2: Water filtration experiment

Description
This activity will help students understand the role of soil in cleaning and filtering water.

Learning outcomes
- Understanding that soil acts as a natural water filter
- Recognition of different soil layers and their filtering properties
- Connection to groundwater protection and water cycle
- Appreciation for soil's role in providing clean water

Materials
- Clear plastic bottles (cut in half to create funnels)
- Coffee filters or fine cloth
- Different soil layers:

- Coarse gravel
- Fine gravel/small stones
- Sand
- Garden soil (Tip: Make sure that the soil or compost is not too dry, otherwise it will initially not take up much water and ink).
- Clay (if available)
- "Dirty water" mixture (water + ink)
- Clear collection containers
- Measuring cups
- Stopwatch
- Observation recording sheets
- Funnels
- Magnifying glasses

Setup instructions
Cut plastic bottles in half, invert tops to create filter funnels. Set up separate containers with each filtering material. Mix water with soil, small organic debris, and ink to create visibly contaminated water. Arrange clear containers to catch filtered water. Provide stopwatches for measuring filtration rates.

Step-by-step process
Part A: Filter construction (4 minutes)

Students can choose how they arrange layers of substrates and compare to some real-world soil profiles base on pictures (see Curiosoil's inventory of images).

Students create soil filter layers in their bottle funnels. If they prefer to follow more specific instructions, you can propose this layering:
1. Coffee filter at bottom (to prevent soil loss)
2. Layer of coarse gravel at top
3. Layer of finer gravel
4. Layer of sand
5. Layer of fine gravel
6. Soil rich in nutrients (compost)

Alternative:

Students predict what will happen to the dirty water.

Part B: Filtration testing (4 minutes – might take longer in clayey soil)

Slowly pour dirty water through the filter system.

Observation
- Time how long filtration takes.
- Observe colour changes in filtered water.
- Note any particles that pass through.

- Compare filtered water clarity to original dirty water.

Recording
Document observations about water quality changes.

Part C: Results analysis (1 minute)

Students compare their filtered water with the original contaminated water.

Discussion questions:
- "How did the water change as it moved through the soil layers?"
- "Which layer seemed to clean the water most effectively?"
- "How might this happen in nature when it rains?"

Take-away message: Soil filters pollutants. Water transports pollutants as well as nutrients down the soil profile (and also vertically e.g. down a hillslope).

- Station 3: Habitat observation (soil organisms)

Description
This activity will help students understand soil as a living ecosystem that provides habitat for organisms.

Learning outcomes
- Recognition that soil is a living, dynamic ecosystem
- Understanding that many organisms depend on soil for survival
- Appreciation for biodiversity in soil environments
- Connection between soil health and organism diversity

Materials
- Fresh soil samples from different environments (garden, forest, compost). Make sure the samples are NOT from protected areas, and you have asked for permission from the owner of the land.
- White plastic trays or plates
- Magnifying glasses
- Microscopes (if available)
- Small brushes or tweezers
- Observation charts with common soil organism pictures
- Digital microscope/camera for projection (optional)
- Small containers for temporary organism observation
- Identification guides with pictures
- Recording sheets with organism tally charts

Setup instructions
Gather fresh soil samples from various locations on the morning of the lesson. Usually, a compost pile, forest soil or a covered sandbox is a good start to get lucky. Remember that

soil organisms are less active when it is cold. 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. Set up white trays for easy organism spotting. Display charts showing common soil organisms (worms, beetles, springtails, etc.). Arrange magnifying glasses and microscopes if available. Ensure gentle handling protocols for any organisms found.

Step-by-step process
Part A: Initial soil exploration (3 minutes, can be much longer)

Students carefully spread soil samples on white trays. They look for movement and visible organisms. They take a handful of soil and look for life. They begin tally chart of organisms observed.

Part B: Detailed investigation (4 minutes)
Students use magnifying glasses to examine soil more closely. They compare findings with identification charts. They watch how organisms move and interact with soil or other organisms.

Part C: Ecosystem understanding (1 minute)

Discuss how soil provides everything organisms need:
- Food (organic matter, other organisms)
- Shelter (spaces between soil particles)
- Water (held in soil pores)
- Air (in soil spaces)

Based on that: Discuss where hotspots of activity in soil may be:
- *Close to the soil surface*
- *Close to roots (as they excrete nutrients)*

Close to earthworm burrows and casts
Follow with a discussion of who eats whom/what in soil.

Group management and station rotation

Students are divided into 3 groups. Each group should have an adult (teacher assistant or parent) to supervise and explain instructions. If only one teacher is available, try the experiments in small groups of 2-3 students all guided by the teacher.

Within each group assign roles:
- Materials manager: responsible for gathering and returning equipment
- Recorder: writes/draws observations
- Observer: leads the looking and describing
- Reporter: shares findings with the class

Use a consistent signal (bell, clap pattern) for transitions.

Groups spend 10–12 minutes per station (including 1 minute transition).

Visit each station regularly to check understanding. Use open-ended questions to deepen thinking:
- "What evidence do you see that supports your conclusion?"
- "How does this connect to what we observed in the mystery boxes?"
- "What patterns are you noticing?"

Common misconceptions to watch for:
- "All soil is the same"
- "Only worms live in soil"
- "Soil doesn't need to be clean"
- "Plants would grow just as well without soil"

Use evidence from experiments to guide students toward accurate understanding. Leave enough time to answer questions.

Culminating discussion (Final 2 minutes of Phase 2)

Each group shares one key discovery from each station. Guide students to see connections between stations. Begin to identify the three main soil functions:
1. Supporting plant growth (from Station 1)
2. Filtering water (from Station 2)
3. Providing habitat (from Station 3)

Transition to Phase 3

- Bridge building: "Now that we know what soil DOES, let's investigate the different TYPES of soil and why they're different.
- Vocabulary reinforcement: Quick review of key terms learned.
- Curiosity building: "I wonder if different types of soil are better at different functions..."

PHASE 3: SOIL DIVERSITY INVESTIGATION (25 MINUTES)

Description
Through systematic testing and observation, students will classify soil types and understand the relationship between soil characteristics and their functions.

3.1. Soil sample comparison

Materials
- Soil samples (4-5 different types in labelled containers): garden, forest, agriculture, urban. You can also use sand, soil close to a river or lake and compost. Compost is not soil but is visually different and easier to find than peat soil.
- Testing equipment:
  - Clear plastic jars with lids (for shake test)
  - Water for tests
  - Measuring spoons
  - Hand lenses/magnifying glasses
  - White paper plates for observation
  - Rulers for measurement

- Recording materials:
  - Investigation recording sheets
  - Coloured pencils for soil colour documentation
  - Clipboards
  - Texture vocabulary cards

Setup instructions
Set up the investigation stations, each with a different soil sample. Each station should have a complete testing kit. Display and explain texture vocabulary (see Annex) and colour charts. Provide structured investigation sheets with clear sections.

Investigation
Test 1: Visual observation (5 minutes)

Students examine each soil sample and match colours to provided colour chart. They use magnifying glasses to observe different sized particles. They look for visible plant material, leaves, or other organic components. They try to spot any visible mineral crystals or rock fragments.

Recording
Students circle closest colour match on chart and use coloured pencils to record. They draw what they see under magnification. They write/draw different materials observed in soil

Guided questions:

- "What colors do you see in this soil sample?"
- "Can you identify different sized particles?"
- "What materials other than soil particles can you spot?"

Test 2: Feel test (texture analysis) (15 minutes)

Process
Students rub dry soil between fingers and describe texture. They add small amount of water and knead soil, then describe changes. They try to roll wet soil into a "snake" shape. They form wet soil into ball and observe if it holds shape.

Recording
Students choose from provided words (gritty, smooth, sticky, crumbly, rough, silky). Check that they understand the differences between e.g. gritty and crumbly. They record whether soil can be rolled or shaped. They compare texture to familiar objects (sand, playdough, powder/flour).

Texture classification
Sandy feel: Gritty, rough, won't stick together when wet.
Clay feel: Smooth, sticky, can be moulded when wet.
Loamy feel: Slightly gritty but holds together, not too sticky.

Test 3: Shake Test (Particle Separation) (8 minutes)

Process
Add 2 tablespoons of soil to clear jar. Fill jar 2/3 full of water. Screw on lid tightly and shake vigorously for 30 seconds. Let jar sit undisturbed and observe layer formation. After 3-5 minutes, measure different layers with ruler.

Recording
Sketch the settled layers in jar outline on recording sheet. Record thickness of each visible layer. Label layers (stones/gravel, sand, silt, clay, organic matter).

Expected results
- Sandy soil: Thick bottom sand layer, thin clay layer on top.
- Clay soil: Thin sand layer, thick clay layer, water may remain cloudy.
- Loamy soil: Balanced layers of sand, silt, and clay.

Guided questions:
What do the results tell you?
Why do you think the results are relevant for our everyday life?

Test 4: Water absorption test (4 minutes)

Process

Place equal amounts of each soil type in separate containers. Add same amount of water to each sample. Time how quickly water is absorbed or if it pools on surface. Note if water drains through or stays on top.

Recording
Note seconds for water absorption
Describe drainage: Fast, medium, slow, or no drainage
Describe what happens to water (absorbed, pooled, drained through).

Printable material

SOIL INVESTIGATION SHEET

Soil Sample: _____

VISUAL OBSERVATION
Colors seen: ⬜ Brown ⬜ Black ⬜ Red ⬜ Yellow ⬜ Gray ⬜ Other: ____
Particles observed: ⬜ Large rocks ⬜ Sand grains ⬜ Tiny particles ⬜ Plant pieces
Draw what you see under the magnifying glass:
[Drawing space]

FEEL TEST
Dry texture feels: ⬜ Gritty ⬜ Smooth ⬜ Powdery ⬜ Rough ⬜ Other: ____
Wet texture feels: ⬜ Sticky ⬜ Slippery ⬜ Crumbly ⬜ Slimy ⬜ Other: ____
Can you roll it into a snake? ⬜ Yes ⬜ No
Can you make a ball that holds together? ⬜ Yes ⬜ No

SHAKE TEST
Draw the layers you see:
[Jar outline for drawing]
Measure each layer:
Bottom layer (sand): _____ cm
Middle layer (silt): _____ cm
Top layer (clay): _____ cm

WATER TEST
Time for water to soak in: _____ seconds
Water behaviour: ⬜ Soaked in quickly ⬜ Soaked in slowly ⬜ Stayed on top ⬜ Drained through

MY CONCLUSION
I think this soil is: ⬜ Sandy ⬜ Clay ⬜ Loamy ⬜ Other: _____

3.2. Mini-Lesson: Why soils are different (Final 5 minutes)

Introduction
Explain how weather affects soil formation. Discuss how soil forms very slowly over hundreds of years. Introduce idea that soil comes from broken-down rocks and dead residues of (micro)organisms and plants. Connect different environments to different soil types.

Discussion
Show photos of different landscapes and ask students if they have seen similar. Discuss what type of soil is found around their school/community. Link soil types back to the functions explored in Phase 2.

PHASE 4: SOIL HEALTH ASSESSMENT (25 MINUTES)

Description
This phase helps students identify threats to soil health and connect human activities to soil degradation through comparative studies and demonstrations.

4.1 Soil protection: How can we help?

Discussion about what the students think they can do to help soil.

E.g. pick up waste and throw it in the appropriate waste bin; help a snail or an earthworm that is on the pavement and put it back to a meadow/green space. Focus on the positive narrative and what each of us can do to help!

2. Soil threats and solutions. Demonstration stations (12 minutes total - 4 minutes per station)

Station A: Erosion

Materials
- Two identical shallow pans
- Soil samples (one with grass/plants, one bare)
- Watering cans with different flow rates
- Collection trays
- Small flags to mark erosion patterns
- Timer

Process
Set up two soil samples (e.g. take two soil blocks with a spade) – one covered with grass, one bare. Pour water from height to simulate rain. Students watch and record which soil erodes more. Measure soil lost in collection trays. Discuss how this happens in nature.

Recording
- Sketch erosion patterns
- Measure soil loss
- Predict what would happen in heavy rain
- List ways to prevent erosion

Station B: Pollution impact

Materials
- Clear containers with soil samples
- Safe "pollutants" for demonstration (coloured water, cooking oil, sugar)
- Before/after photo examples
- Magnifying glasses

- Absorption materials (paper towels)

Process
Add different "pollutants" to soil samples. Watch how pollutants affect soil appearance and structure. Try to remove pollutants and discuss difficulty. Look at real examples of polluted vs. clean soil.

Discussion questions
- "What happens when chemicals spill on soil?"
- "How might pollution affect plants trying to grow?"
- "What pollution sources exist in our community?"

Station C: Human activity

Materials
- Photo cards showing different human activities:
  - Farming with heavy machinery
  - Construction/building
  - Deforestation
  - Mining
  - Urban development
  - Overgrazing by livestock
- Impact prediction worksheets
- Before/after aerial photographs

Process
Students examine human activity photos. They discuss how each activity might affect soil. They create simple diagrams showing activity → soil impact. They generate ideas for reducing negative impacts.

Recording template

HUMAN ACTIVITY IMPACT ANALYSIS

Activity: _____

How this activity might harm soil:
1. _____
2. _____
3. _____

How this activity might help soil:
1. _____
2. _____

Ways to make this activity more soil-friendly:
1. _____

2. _____

3. Discussion (5 minutes)

Compile master list of soil threats identified. Group threats into natural vs. human caused. Discuss which threats are most serious in local area. Connect threats back to soil functions from Phase 2.

Local connection: Identify soil health issues in local area. Discuss what students have observed in their neighbourhood and how soil health affects their daily lives.

PHASE 5: SOIL SOLUTIONS WORKSHOP (25 MINUTES)

Phase 5 empowers students to become soil conservation advocates by generating practical solutions and creating action plans they can implement in their own lives and community.

5.1. Brainstorming Session: How can we help our soil?

Materials
- Large chart paper or whiteboard
- Coloured markers
- Sticky notes for individual ideas
- Solution category headers
- Timer for brainstorming rounds
- Example solution cards for inspiration

Step-by-step process
1. Idea generation in small groups (3 minutes)
Students write one solution per sticky note.
- Prompting questions:
  - "How can we protect soil from erosion?"
  - "What can we do to keep soil healthy?"
  - "How can we reduce soil pollution?"
  - "What can we grow or build to help soil?"

Encourage as many ideas as possible, no evaluation yet.

2. Sorting (3 minutes)
- Solution categories:
  - At home: Things families can do
  - At school: Actions for school environment
  - In community: Neighbourhood and local solutions
  - Growing things: Plant-based solutions
  - Reducing harm: Stopping damaging activities

3. Idea building (2 minutes)
- Piggyback ideas: Students build on others' suggestions.
- Combination solutions: Merge related ideas into stronger concepts.
- Detail addition: Add specifics to general ideas.

Student solutions to expect
- Home solutions: Composting, garden creation, reducing chemicals
- School solutions: School garden, erosion barriers, education campaigns
- Community solutions: Tree planting, cleanup days, policy advocacy
- Growing solutions: Cover crops, grass planting, reforestation
- Prevention solutions: Proper waste disposal, sustainable farming support

Help students who have no or little access to nature by pointing out opportunities in cities.

4. Assignment after class: Ask parents, grandparents and siblings what they do to help soil and whether they would like to start a protection activity together. Discuss students' experiences in the next class and re-assess together what each of us can do for soil protection.

5.2. Action planning: class soil protection charter (10 minutes)

Step-by-step process

1. Priority selection (5 minutes)
- Students vote for top 5 most practical solutions.
- They consider what the class can realistically accomplish.
- They choose solutions that will make a meaningful difference.

2. Charter writing (3 minutes)
- The students collaboratively create a class commitment statement.
- They list concrete steps the class will take.
- They assign realistic deadlines for each action.

3. Individual commitments (2 minutes)
- Each student chooses personal soil protection actions.
- They choose a partner to support each other's commitments.
- They plan how to monitor and celebrate success

4. Display (5 minutes)
- Write commitments on large poster
- All students sign the charter
- Decorate with soil protection symbols
- Display prominently in classroom

5. Assignment for the whole class:
a) Tell another class in the school about your favourite activities to protect soil. Choose one or two experiments and teach another class how to perform them (peer-to-peer teaching).
b) Prepare a poster with photos and/or drawings together (both classes) and display it in the hallway. How do other school children react to the poster?

SYLLABUS CONTENT REFERENCE

Science curriculum links

- Living things and their environment
  - Habitats and how organisms depend on their environment
  - Food chains and ecosystems
- Materials and their properties
  - Investigating materials and their characteristics
  - Comparing and grouping materials
- Scientific inquiry
  - Asking questions and making predictions
  - Conducting fair tests and investigations
  - Recording and interpreting results

Geography curriculum links

- Physical geography
  - Understanding landscapes and natural processes
  - Human impact on the environment
- Environmental awareness
  - Sustainability and conservation
  - Local and global environmental issues

Cross-curricular connections

- Mathematics: Data collection, measurement, graphing, or designing small soil-related stories as text information for calculations
- Language: Scientific vocabulary, report writing, discussion, write a poem or (short) stories
- Art: Soil art creation, observational drawing, forming soil, pottery
- Personal, Social, Health and Economic: Environmental responsibility, community action
- Sports or Drama: Move together like a soil animal (earthworm or isopod/jumping all together to move ‘isopod feet’ simultaneously), dig a soil profile 😊
- Music: there are songs about soil animals (e.g. in German “Hörst du die Regenwürmer husten”, Compost rap)
- Geography: What do soils look like in different parts of the world?
- Organizing a soil school party

Assessment

Formative assessment

- Observation during hands-on activities
- Questioning throughout the lesson
- Peer discussions and explanations
- Investigation sheet completion

Summative assessment

- End-of-lesson quiz on soil competence areas

- Group presentation of soil solutions
- Individual reflection on learning objectives

Differentiation strategies

For advanced learners
- Extended investigation with pH testing
- Research project on local soil conservation
- Leadership roles in group activities

For struggling learners
- Visual aids and hands-on support
- Simplified recording sheets
- Buddy system for investigations
- Step-by-step guidance cards

For students whose first language is not the language of instruction
- Visual vocabulary cards
- Bilingual resources where possible
- Practical demonstrations with minimal language demands

Extension activities
Immediate extensions
- School garden soil improvement project
- Worm composting system setup
- Soil erosion prevention plan for school grounds

Home learning
- Family soil audit and improvement suggestions
- Community soil conservation poster creation
- Local soil expert interview (farmer, gardener, scientist)

Health and safety considerations
- Hand washing facilities after soil handling
- Allergy awareness for plant materials
- Safe handling of investigation equipment
- Clear workspace organization
- Adult supervision during all practical activities

Soil texture vocabulary

- Sandy soil (light coloured, gritty texture)
- Clay soil (sticky when wet, fine particles)
- Loamy soil (balanced mixture, dark and crumbly)
- Peaty soil (very dark, organic matter visible)
- Chalky soil (light coloured, may have white particles)