STEAM Education & Leadership Workshops

Student Activity Lesson Plan - The Soil Beneath Us

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Age range
9-12 years old

Learning objectives
- Learners will explore different types of soil and understand their importance for plant growth.
- Learners will identify and discuss the essential components plants need to grow.
- Learners will develop observational skills through planting and monitoring seeds and exploring sustainable practices to support plant growth in water-scarce environments.
- Learners will discuss the community challenge of water scarcity and experiment with a water recycling solution.
- Learners will develop skills in observation, innovation, and critical thinking through hands-on activities.

Structure of the lesson
- Introduction to Soil (15 minutes)
- Planting Seeds and Identifying Growth Needs (20 minutes)
- Addressing Water Scarcity and Water Recycling (30 minutes)
- Excursion – Observing Plants in the Environment (15 minutes)
- Global connection (20 minutes)
- Reflection and Closing (20 minutes)

Duration
2 Hours

Note to Educators
Contextualize for Local Relevance
Use examples of soil and environmental challenges specific to the learners' region. Highlight how soil quality affects local agriculture and ecosystems, emphasizing the importance of sustainable practices in water-scarce areas.

Facilitate Hands-On Exploration
Encourage students to touch and observe different soil samples. Use sensory prompts like "Is it gritty or smooth?" to help them engage fully. Incorporate local soil samples to make the lesson relatable and engaging.

Integrate Sustainability Themes
Highlight the importance of water conservation and soil health. Use the water filter activity to teach practical, eco-friendly solutions that can be applied in their homes or communities.

Connect Local and Global Issues
Discuss how soil degradation, erosion, and water scarcity affect food security globally and locally. Show examples of innovative solutions, such as irrigation systems or cover cropping, and explore how they might be adapted to the learners' environment.

Promote Critical Thinking and Innovation
Guide learners in brainstorming solutions to soil and water-related challenges. Encourage creativity by allowing them to design small-scale interventions, such as composting or water recycling projects.

Timing	Facilitator's actions	Students outcomes	Technical notes
0-15 min	**Introduction to Soil** **Slide 2**: Introduce the topic of "The Soil Beneath Us" with a simple and engaging question like "What role does soil play in supporting life?" Include an image that depicts this. **Slide 3**: Show an image of soil and have the learners tell you their own definition of soil. Then, give your own definition. **Slide 4**: Show a diagram that explains the importance of soil. **Slides 5 and 6**: Provide learners with samples of sandy, clay, and loamy soil. Have them feel, observe, and discuss the texture, color, and appearance of each soil type. **Slide 7**: Discuss the relationship between soil quality and plant growth, focusing on how different soil types retain water and nutrients.	**Awareness** Start by encouraging students to explore their understanding of soil and reflect on its fundamental role in supporting life on Earth. This awareness helps them recognize soil as a valuable resource, essential for ecosystems and plant health. Through this reflection, they begin to understand soil's significance as a source of growth and stability, laying the groundwork for exploring further topics in the lesson. **Mastery** This section involves hands-on activities where students analyze and evaluate different soil types (sand, clay, loam, and garden soil) by observing characteristics like texture, color, and water retention. Mastery is achieved as learners deepen their foundational knowledge by comparing soil qualities, practicing observational skills, and making connections between soil types and their suitability for plant growth.	Encourage learners to touch and describe each soil sample. Use prompts like, "Does it feel gritty or smooth?" to discuss which types might retain water best. Emphasize the idea of nutrients in the soil and how they differ between soil types.
16-35 min	**Slide 8**: Planting activity: Guide learners to plant bean seeds in polythene nylon or containers. Learners plant the seeds in groups.	**Agency** In this planting activity, learners take independent and collective action by planting seeds and making predictions about plant growth outcomes. This active participation helps them find their voice in scientific inquiry, promoting a sense of agency in their learning process as they track plant development over time.	Have students observe growth over time. Prompt them to record changes.
36-65 min	**Slide 9**: Address the issue of water scarcity in the learners' environment and its effect on plants. **Slides 10 and 11**: Learners create a simple water filter from materials like charcoal, sand, rocks, and plastic, allowing them to recycle wastewater for plant use.	**Awareness** During this segment, learners engage in a discussion about the local issue of water scarcity, considering its impact on plant growth and the need for sustainable water use. By exploring how their handmade water filters can help address this challenge, they develop a greater social awareness of environmental issues. This activity allows them to recognize the role of their actions in responding to local needs and builds a sense of purpose as they actively participate in sustainable solutions within their community.	Prepare a sample of the handmade water filter and demonstrate how it purifies water. Discuss the filtration materials used and their purpose (e.g., charcoal for absorbing impurities).
65-80 min	**Slide 12**: Take learners on a short walk to observe different plants and the soils they grow in. Encourage them to note any signs of healthy or unhealthy plants and the type of soil they are growing in.	**Connectedness** The excursion encourages learners to observe and value the perspectives of peers as they collectively examine plant health and soil types in their environment. They work collaboratively, sharing their observations and brainstorming ways to support plant growth. This activity fosters a sense of global-mindedness and empathy, as learners consider environmental challenges and support each other's contributions to solving them. Through this collective experience, they build connectedness by observing real-world applications of their classroom learning.	Plan the route to include areas with various plant and soil types. Allow learners to jot down observations and share ideas on improving soil conditions or using alternative water sources.

81-100 min	**Slide 13**: Show learners a picture that illustrates global soil challenges, such as erosion, nutrient depletion, and salinization. Explain how these challenges impact agriculture and food security. Facilitate a discussion by asking students if they've noticed any soil issues in their community or on a global scale. **Slide 14**: Use images to illustrate solutions like terracing, planting cover crops, irrigation systems, and building drainage systems.	**Awareness and Empathy** Learners develop an understanding of global soil issues and how these challenges impact food production and communities worldwide. They also recognize the importance of soil conservation and how technological solutions can mitigate soil degradation. **Critical Thinking and Problem-Solving** Learners analyze various soil-related challenges and explore innovative technological solutions to address these issues. They also apply critical thinking to evaluate the effectiveness of different soil technologies and consider how they might be adapted to local environments. **Personal and Community Impact** Learners set personal goals for soil conservation, such as composting or reducing chemical use, and envision how these practices can benefit their community. Learners also strengthen their global-mindedness by understanding that individual actions can contribute to broader environmental solutions.	Use clear and engaging images of soil challenges and technological solutions. Use guided questions to help learners focus on the key aspects of each solution.
101-120 min	**Slide 15**: Reflection and closing: Review the lesson and encourage reflection on what was learned. Facilitate a group discussion with the prompt "What did you learn about soil and water's role in plant growth?"	**Wellbeing** This reflective session allows learners to feel secure in expressing their thoughts, observations, and learning experiences. As they share personal takeaways and reflect on the lesson's themes, they experience a sense of belonging and optimism about their role in sustainable practices. By providing a supportive environment, this outcome fosters positive, joyful engagements, encouraging learners to feel confident and connected to the community and environmental goals.	Encourage learners to think of small, everyday actions they can take to conserve water or improve soil quality in their own homes or communities.