

Stimulating Science Simulations

THE GRASS IS ALWAYS GREENER...

1.E.2

Understand the physical properties of Earth materials that make them useful in different ways.



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Aligned to NC Essential Standard 1.E.2

Understand the physical properties of Earth materials that make them useful in different ways.

Student Knowledge:

Students know:

- ✚ earth materials include solid rocks, soil and water, which all have different observable properties.
- ✚ from prior experiences that earth materials (matter) may be described by their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, floating or sinking in water).
- ✚ that earth materials that retain their shape regardless of the container they occupy are classified as solids.
- ✚ know that water is an Earth material that takes the shape of the container it occupies and is classified as a liquid.
- ✚ that earth materials have different properties that sustain plant and animal life.
- ✚ that some Earth materials have properties that make them useful in solving human problems.

Students understand:

- ✚ physical properties of Earth materials that make them useful in different ways.

Clarifying Objectives:

Summarize the physical properties of Earth materials, including rocks, minerals, soils, and water, that make them useful in different ways.

Compare the properties of soil samples from different places, relating their capacity to retain water, nourish, and support the growth of certain plants.

Essential Questions:

What are the physical properties of the Earth?

How are the physical properties of the Earth useful? In what ways?

Why do different types of soil make a difference for retention of water?

Why do different types of soil make for nourishment and support of plants?

Differentiation strategies to meet diverse learner needs:

- Flexible grouping
- Tiered assignments



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Sample Materials:

Sand River stones Bean seeds Plastic containers Graduated Cylinders
Clay Small pebbles Top Soil Humus

Key Vocabulary:

silt
rocks gravel
minerals clay
soil humus
water
sand

ENGAGEMENT

Begin with a discussion about plants and gardens. Ask students to share their experiences with growing plants. What do plants need to survive? Find out if any students have a garden at home. Ask students to share how they get the garden ready and what happens as their garden grows. What equipment do you use to garden? Do all gardens look the same? Do all farmers grow the same crops? Why do some gardens have many plants while others have only a few? Give each student a sticky note. On your sticky note, write one thing you wonder about plants and/or gardens and then take your note to our Wonder Wall and post it there. (These will become guiding questions for the teacher during exploration of the topic.)

EXPLORATION

Introduce the simulation. I (the teacher) am local farmer (make up your own fun name for added effect). My gardens never seem to grow very well, so I have decided to hire you (students) to study my farm and make some recommendations for improving my gardens. Some of my gardens tend to stay very wet and some seem to stay dry. Some areas are rocky, some are sandy, and others have a variety of soil types. Could this be affecting the growth of my crops? At this point each group of students will be given a farmland scenario packet to guide the rest of their exploration.

Note: The teacher should stay in character as the farmer as much as possible to encourage students to see this as a real world simulation.

EXPLANATION

As students complete the first task, ask them what variable caused the crops not to grow well. Introduce the idea that some soils hold more water than others. Students should stop and make notes in their packet. Following each scenario, students must report their findings to the owner (teacher). At this point, the teacher explains any important concepts and guides students to record information in their



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packet. This continues throughout the unit until all scenarios have been completed. (Circulate amongst the groups as they work. Offer words of encouragement but limit your assistance.)

ELABORATION

Once students have completed the scenarios, it is time for the groups to develop their recommendations to the farmer. Provide a variety of materials that students can use to build a model of the farmland. Allow ample time for students to work together to build their models. Inform students that they will be responsible for explaining their model to the farmer. The owner is looking for a model that will improve the growth of her crops. Successful models will consider each problem faced in the scenarios and incorporate a method for correcting the problem to create an ideal growing environment.

EVALUATION

Evaluation Tools:

- Teacher observation and anecdotal records.
- Performance Tasks Rubric (see attached)
- Student Notebook
- Writing Probe Final Evaluation – “Explain the effect that the composition of the land has on crop growth. Include important science concepts and vocabulary in your explanation.”

EXTENSIONS

- Make a tree map categorizing crops that grow well in sandy, clay, and/or rocky soil.
- Create a poster to advertise a plant that grows well in any soil.
- Design and build a planter that is made from recycled materials.



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Rubric: Grass is Always Greener

This is a hands-on/minds-on inquiry based simulation in which students discover the relationship between physical properties of various earth materials and the ability of plants to grow.

Levels of Achievement are designed to match the level of education required to attain a career in that field.			
	1 pt. – Requires at least a high school diploma.	2 pts. – Typically requires a minimum 4 year apprenticeship.	3 pts. – Requires a minimum of 2 years post-secondary education.
Training Manual Assesses your ability to maintain accurate records in your notebook.	Contains detailed drawings and notes for 1-2 accomplished tasks.	Contains detailed drawings and notes for 3-5 accomplished tasks.	Contains detailed drawings and notes for every accomplished task.
Problem-Solving Assesses your ability to be persistent, ask good questions, and try many different strategies to accomplish your task.	Employs 1 or 2 strategies to accomplish each task. Requires frequent encouragement and arrives at a solution for each task only after a great deal of extra support.	Employs 2-3 strategies to accomplish each task, is easily encouraged and arrives at a solution for each task with minimal extra support.	Employs multiple strategies to accomplish each task, is persistent, asks questions and requests additional materials as needed.
Team Work Assesses your ability to cooperate with your partner, share materials, encourage others, and be responsible.	Shares responsibility and takes turns throughout some of the simulation.	Values the ideas of group members. Shares responsibility and takes turns throughout most of the simulation.	Values the ideas of group members. Cooperates well and encourages other groups to keep trying until they succeed. Shares responsibility and takes turns throughout the entire simulation.
Technical Vocabulary Assesses your ability to implement new vocabulary into your discussions, problem-solving, and notebook.	Makes very little use of the new vocabulary as it is introduced and during subsequent tasks throughout the simulation.	Makes use of some of the new vocabulary as it is introduced and during subsequent tasks throughout the simulation.	Makes use of all new vocabulary as it is introduced and continues to use these words appropriately in subsequent tasks throughout the simulation.
Teacher comments:		Final Grade:	



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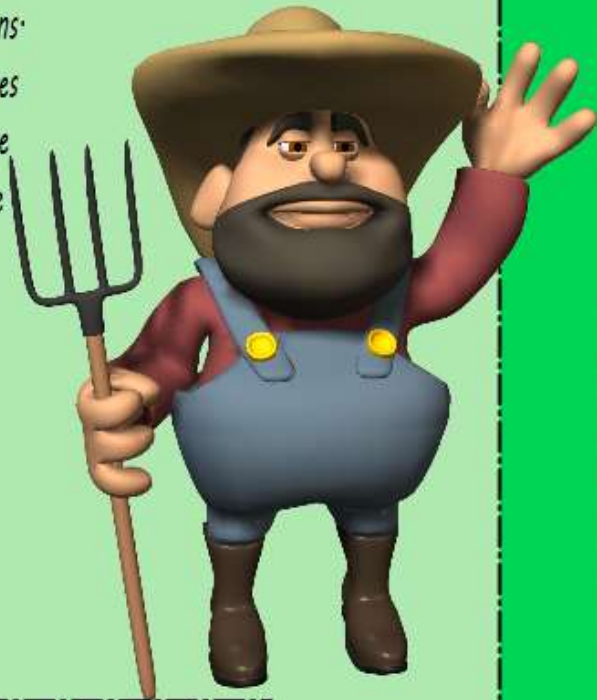
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Grass is Always Greener - Background Info.

Farmer Green

Hi! I'm Farmer Green.

I own a great big farm divided into 5 big gardens. Sometimes my crops grow alright but sometimes they don't. I brought you some samples of the soil in my gardens. Maybe you could run some tests and help me to make better choices for planting my next crop.



Garden 1

sand
topsoil
small pebbles

Garden 2

clay
topsoil
small pebbles

Garden 3

topsoil
river rocks
humus

Garden 4

clay
river rocks

Garden 5

humus

Grass is Always Greener - Scenario 1

SOIL PREP

Using the information supplied by Farmer Green, create 5 mini gardens with similar soil structures. Test each garden to see how it reacts to water. Measure 100 mL of water into a graduated cylinder and slowly pour the water into a garden until the water begins to puddle on top. Calculate the amount of water each garden can hold before becoming saturated.



Garden 1

sand
topsoil
small pebbles

Water ___ mL

Garden 2

clay
topsoil
small pebbles

Water ___ mL

Garden 3

topsoil
river rocks
humus

Water ___ mL

Garden 4

clay
river rocks

Water ___ mL

Garden 5

humus

Water ___ mL

Grass is Always Greener - Scenario 2

SOWING SEEDS

Farmer Green wants to grow some beans. Which garden will provide the best conditions for growing beans? Make a plan and find out which garden he should plant his bean seeds in. Record your bean growth in the space provided.



Garden 1

Garden 2

Garden 3

Garden 4

Garden 5

Credits:

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