



# Soils

Teacher Lesson Manual

**Free  
Digital  
Sampler!**



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### Soils - Sample Lesson

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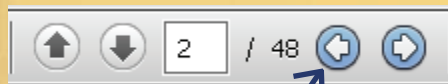
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Science Companion



# Teacher Lesson Manual

**The Teacher Lesson Manual** engages and guides teachers to implement hands-on science lessons with their students. Lesson by lesson, students develop strong process skills and in-depth understanding of specific concepts.

The book brings teachers up to speed for the science content through “Teacher Background Information” and in-context lesson notes. Teachers can feel comfortable with leading the class—whether they have a long history of teaching science or not.

Each Teacher Lesson Manual focuses on a set of Big Ideas for a science topic. Each lesson focuses on a Big Idea. Groups of lessons (called clusters) develop a Big Idea through a series of different experiences and discussions.

## Lessons Follow a Consistent Sequence

★ **Engage** – In this section of a lesson, the teacher introduces the topic. The goal is to briefly generate interest, activate prior knowledge, or link the day’s activities to what has come before.

★ **Explore** – This is often (but not always) a hands-on exploration conducted in small groups. Students record their work in their Science Notebooks. Collaboration with peers is encouraged. Key materials are provided in the ExploraGear kit.

★ **Reflect and Discuss** – In this important section, the teacher and students discuss what they observed, share ideas and data, and reflect on the day’s activities. This portion of the lesson brings the class back to the Big Idea.

You’ll find that while the lesson format is very consistent, students explore science content and the process of “doing science” in a large variety of ways.

*You’ll also find that students LOVE the mix of active, hands-on, minds-on science.*

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# Lessons at a Glance

## Unit Overview

The Soils Unit begins with children exploring the properties of soil. They use their senses to observe and describe dry and fresh soil samples. As the unit progresses, children use simple science tools and build basic equipment to discover different components of soil. They agitate soil in a jar of water to observe how it settles into layers, and sift soil to compare its components. They build simple equipment to measure drainage of different types of soil. Finally, they read a book to learn about the role of earthworms in creating healthy soil.

## Science Content: Big Ideas

The Soils Unit concentrates on the following Big Ideas. Along with the scientific Habits of Mind discussed on pages 6-7, these concepts are reinforced throughout the unit. The lessons in which each Big Idea is introduced or is a major focus are indicated in parentheses.

Here are the Big Ideas for Soils.

### *Lessons*

- Soil is composed of different amounts of pebbles, sand, silt, clay, and organic material. (Lessons 1–4)
- Earthworms return nutrients to the soil to be used by plants and other organisms. (Lesson 5)

### *Skill Building Activities*

- Observation is a powerful tool for learning about something, and detailed and accurate descriptions help you communicate your observations. (Skill Building Activity 1: Observing and Describing)
- A magnifying lens makes things look larger than they really are. You can use a magnifying lens to examine objects closely and to see details that you might not see without it. (Skill Building Activity 2: Using Magnifiers)

# Unit Summary

Properties of Soil (Lessons 1–5)	
<b>Overview</b>	Children use their senses of sight, smell, and touch to observe and describe soil. They use simple science tools (such as magnifying lenses, soil sifters, drainage testers) to analyze soil components and their properties. They measure how quickly water drains through several soil samples and how much water the soils retain. They learn about the effect of organic material on soil and discover the importance of earthworms for building soil.
<b>Science Content</b>	<ul style="list-style-type: none"> <li>• Soil is composed of different amounts of pebbles, sand, silt, clay, and organic material.</li> <li>• Different types of soils have different abilities to drain and to retain water.</li> <li>• Earthworms return nutrients to the soil that plants and other organisms use.</li> </ul>
<b>Science Center</b>	<ul style="list-style-type: none"> <li>• Observe and compare soil samples collected from different places.</li> <li>• Continue to explore soil components (pebbles, sand, silt, clay, and compost).</li> <li>• Observe fresh soil samples and jars of suspended soil.</li> <li>• Practice using a sieve to separate bean and flour mixtures and use a magnifying lens to observe the separated materials.</li> <li>• If one is available, use a microscope to look closely at sifted soil samples.</li> <li>• Use drainage testers to test various materials, including clay, compost, and silt.</li> <li>• Observe worms and look for worm castings in a soil sample containing earthworms.</li> </ul>
<b>Family Links</b>	<ul style="list-style-type: none"> <li>• Make an edible soil profile for dessert.</li> </ul>
<b>Further Science Explorations</b>	<ul style="list-style-type: none"> <li>• Create a living model to demonstrate how soil components fit closely together.</li> <li>• Demonstrate how running water separates soil components.</li> <li>• Model how water can move upward through soil through capillary action.</li> <li>• Create several models of soil using various sized beans and demonstrate how water drains through soils differently.</li> <li>• Investigate other living things that make their homes in and help build soil.</li> <li>• Compare the growth rate of beans planted in different soil components.</li> </ul>
<b>Cross-Curricular Extensions</b>	<p><b>Language Arts:</b> Create a “soil” word bank and banner to record descriptive words.</p> <p><b>Social Studies:</b> On a local map, mark the location where soil samples were collected.</p> <p><b>Mathematics:</b> Create bar graphs to plot drainage times of two soil samples.</p> <p><b>Art:</b> Draw earthworms in soil and showing how they enrich soil.</p>

# Lesson 4

## Measuring Soil Drainage

### A QUICK LOOK

#### Big Idea

Different types of soils have different abilities to drain and to retain water.

#### Process Skills

- Drawing conclusions
- Measuring
- Observing

#### Overview

Children measure how quickly water drains through several soil samples and how much water soils retain. They discover that water drains through coarse-grained soils faster than fine-grained soils. They also find that fine-grained soils retain more water than coarse-grained ones.

#### Key Notes

- Decide how you want to schedule this lesson. In the first part of the exploration, the children build drainage testers to measure how rapidly water drains through soil. In the second part of the exploration, they use the drainage testers to measure how quickly water passes through different soil materials. You may want to have children build the drainage testers in one session and then conduct their investigation during a later session.
- Children will need samples two types of soil: one that has more pebbles, the other with more sand and silt. There may be suitable differences in children's soil samples to represent these soil types. If not, see the preparation section for suggestions of how to prepare special soil mixtures for the exploration.
- For more information about the science content in this lesson, see the "[Soil Drainage](#)" section of the Teacher Background Information on page 106.

# Lesson 4

## Standards and Benchmarks

As the children explore soil drainage and consider reasons for varying drainage speeds, they further develop understanding of Earth Science Standard D (Properties of Earth Materials): “Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants, including those in our food supply,” and The Physical Setting Benchmark 4C (Processes that Shape the Earth, Grades 3-5): “Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks. Soil is made partly from weathered rock, partly from plant remains—and also contains many living organisms.”

By measuring how quickly water drains through soil, students further develop their understanding of The Nature of Science Benchmark 1B (Scientific Inquiry): “People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to the things and noting what happens.”

## Lesson Goals

- Measure the time it takes for water to drain through different soils.
- Measure the amount of water retained by different soils.
- Describe the relationship between particle size and the time it takes for water to drain through different soils.

## Assessment Options

- The synthesizing discussion is a good opportunity to assess children’s ability to apply their understanding of criteria A and B of the [Properties of Soil Rubric](#) to explain different drainage speeds.
- The [Using Science Tools Checklist](#) can help you evaluate children’s skills at assembling and using their drainage testers to conduct their investigations.

## NOTES

Rubric 1: Properties of Soil			
	Criterion A (Lessons 2-4) Soil is composed of different amounts of pebbles, sand, silt, clay, and organic material.	Criterion B (Lessons 1-5) Soil and its components can be compared and classified based on different properties.	Criteria C and D (Lesson 5) Earthworms return nutrients to the soil and improve soil quality.
<b>4 - Exceeds Expectations</b> Explores content beyond the level presented in the lessons.	Understands at a secure level (see box below) and shows an interest in discovering why different soils contain different amounts of these materials.	Understands at a secure level (see box below) and shows an interest in investigating the composition of different types of soil.	Understands at a secure level (see box below) and extends understanding by exploring how other animals and insects can improve soil quality.
<b>3 - Secure (Meets Expectations)</b> Understands content at the level presented in the lessons and does not exhibit misconceptions.	Understands that soil is composed of different amounts of pebbles, sand, silt, clay, and organic material.	Understands that soil and its components can be compared and classified based on properties such as particle size, texture, and color.	Understands that earthworms loosen the soil and return nutrients to the soil by breaking down plant material.
<b>2 - Developing (Approaches Expectations)</b> Shows an increasing competency with lesson content.	Understands that soil is composed of pebbles, sand, silt, clay, and organic material, but does not know that different soils contain different amounts of these materials.	Understands that soil is composed of different materials but has difficulty using properties to compare and classify those materials.	Understands that earthworms improve soil quality but cannot explain how.
<b>1 - Beginning</b> Has no previous knowledge of lesson content.	Does not understand what materials make up soil.	Does not recognize that soil components have different properties.	Does not understand that earthworms improve soil quality.

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## Rubric: Properties of Soil

**Checklist: Using Science Tools**  
Teacher Assessment  
(Lessons 2-4)

TEACHER NOTE: Students use basic tools to conduct their investigations in Lessons 2 and 3. They assemble and use simple equipment in Lessons 3 and 4.

Determine whether the following skills are evident as the student uses science tools. You might assign one point for each criterion that the student demonstrates. You can add specific observations or comments in the space below each criterion.

Name \_\_\_\_\_ Date \_\_\_\_\_

**Criteria:**

\_\_\_\_\_ A. Uses basic tools (for example, magnifying lenses) to extend the senses.

\_\_\_\_\_ B. Uses simple equipment (such as soil suspension jar) to gather data.

\_\_\_\_\_ C. Assembles simple science equipment (such as soil sifter and soil drainage apparatus) and uses it to conduct an investigation.

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## Checklist: Using Science Tools



## Materials

Item	Quantity	Notes
<b>ExploraGear</b>		
<b>Cotton balls</b>	1 bag	To keep soil from falling out of cup holes.
<b>Craft sticks</b>	4 per group	To support drainage testers.
<b>Cups, graduated</b>	4 per group	To pour water and hold drainage water.
<b>Cups, graduated, with holes</b>	2 per group	To hold soil samples. To hold soil samples.
<b>Classroom Supplies</b>		
<b>Clock, with second hand</b>	1 per class	To measure time.
<b>Marker, permanent</b>	1	To label paper bags.
<b>Paper bags, lunch-size</b>	2 per group	To hold soil samples
<b>Water</b>	200 ml (2/3 C) per group	To pour through soil samples.
<b>Previous Lesson</b>		
<b>Pebbles</b>	100 ml (1/3 C)	To test for drainage. From Lesson 3.
<b>Sand</b>	100 ml (1/3 C)	To test for drainage. From Lesson 3.
<b>Silt</b>	100 ml (1/3 C)	To test for drainage. From Lesson 3.
<b>Soil sample, with pebbles</b>	100 ml (1/3 C) per group	To test for drainage.
<b>Soil sample, with sand and silt</b>	100 ml (1/3 C) per group	To test for drainage.
<b>Curriculum Items</b>		
<i>Soils Science Notebook, pages 18–19</i>		
<b>Rubric: Properties of Soil (optional)</b>		
<b>Checklist: Observing and Describing (optional)</b>		
<b>Checklist: Using Science Tools (optional)</b>		

### NOTES

### Preparation

- During the exploration, children will test 100 ml (1/3 C) each of two types of soil:
  - Soil A: with more pebbles
  - Soil B: with more sand and silt

If the children's soil samples do not fit these criteria, create special soil mixtures for the exploration by mixing extra materials (pebbles, or silt and sand) into the samples brought in by children. The goal is to have one sample that drains quickly (more pebbles) and one that drains slowly (more sand and silt). Mixing 1 L (1 quart) of each soil type will provide enough material for all of the groups.

- ❑ Prepare two paper bags of each soil mixture per group. Each bag should contain 100 ml (1 cup) of soil. Mark each bag with the appropriate label: “Soil A” or “Soil B.”
- ❑ Prepare materials for the drainage testers. Locate the cups with holes and cotton balls. Pull each of the cotton balls into fourths. Using a pencil or similar object, push the cotton pieces to plug up the hole in the cups. Be sure to plug the cups so that soil cannot spill out, but that water can still drain.

**TEACHER NOTE:** You will use these drainage-testing apparatuses to show the children how to make their own apparatuses to use to test their soil samples.

- ❑ Use the materials sifted by the children in the previous lesson to fill one drainage tester with 100 ml (1/3 C) of pebbles, one drainage tester with 100 ml (1/3 C) of sand, and one drainage tester with 100 ml (1/3 C) of silt. Label each cup’s contents using a permanent marker.
- ❑ Fill three cups with 100 ml (1/3 C) of water and place them next to the drainage testing apparatuses. These are the “input” cups. (See the diagram of the drainage testing apparatus below.) You will use these drainage-testing apparatuses to show the children how to make their own apparatuses to use to test their soil samples.

## Vocabulary

- absorb** . . . . . The way that one material takes in another material.
- drainage** . . . . . The ability of water to flow downward through something.
- permeability** . . . . . The rate that water can move through something.
- pore** . . . . . The space between particles.
- porosity** . . . . . How much of the volume of something is taken up by empty space and how those empty spaces are interconnected.

**TEACHER NOTE:** Depending on the age of the children in your class, it may not be appropriate to formally introduce these terms. It is more important that you model the correct use of these words during the lesson and throughout the unit.

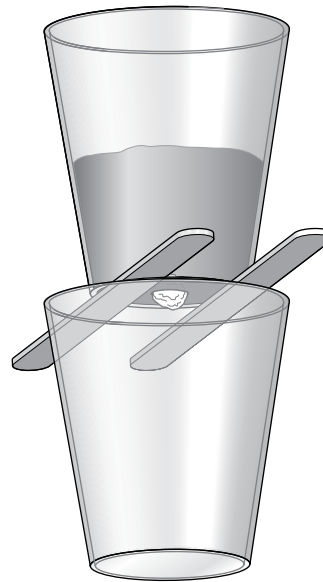
## Teaching the Lesson



### Engage

#### *Modeling the Exploration*

1. Assemble three drainage-testing apparatuses in the front of the room where the whole class can watch. Each apparatus consists of the following:
  - a cup with pebbles, sand, or silt; and a cotton-plugged hole (the “input” cup)
  - two craft sticks to support the drainage tester above the “output cup”
  - an empty cup (the “output” cup)
  - a cup with 100 ml (1/3 C) of water



2. Allow the children to examine (but not touch) the pre-assembled drainage-testing apparatuses. Have them confirm that the same amount of pebbles, sand, and silt is in each of the testers and that the same amount of water is in each of the three “input” cups.
3. Select three children to assist you to pour the water from the three “input” cups into the tops of the drainage testers.
  - a. Ask them to make a prediction about which cup will drain the fastest.
  - b. With the children watching, and with the help of three assistants, simultaneously pour the water from the input cups into the drainage testers.

- c. The children observe what happens. *(They should observe the water drains quickly through the pebbles, slower through the sand, and very slowly through the silt.)*
4. After a few minutes, enough water should have dripped through the testers so that the children can compare how much water has accumulated in the “output” cups. They can also compare how fast the cups drain by counting the drips in each cup during a one-minute period.
5. When the water stops dripping through the pebbles, the children compare the amount of water that drained out of the pebble drainage tester to the amount that was poured into it. They can compare the amount by comparing the water level in the output cup to the 100 ml mark on it. *(The water that drained out of the pebbles should be slightly, but noticeably less than what went in. It should reach a level slightly below the marked level.)*
6. Tell the children that while the other testers finish draining, they are going to investigate why the water flows faster through some samples than through others and why some of the water does not drain through the soil. Explain that each group is going to test their two samples.

**MANAGEMENT NOTE:** Children return to the demonstration drainage testers during the [Reflective Discussion](#) later in the lesson.

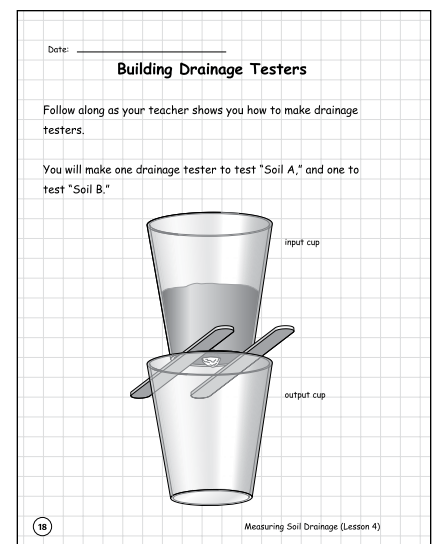
## Explore

### *Building Drainage Testers*

Children build the drainage testing apparatus that they will use to measure how quickly water drains through soil samples.

1. Explain to the children that each group will build two drainage testers, one for each type of soil. Point out the picture of the drainage tester on [page 18 of their science notebook](#).
2. Provide each group with two pre-made “input” cups, four cups, and a bag of each soil sample. Have them assemble their drainage testers along with you as you model the procedure:
  - a. Fill one drainage tester with 100 ml (1/3 C) of “Soil A” and the other with 100 ml (1/3 C) of “Soil B.” Remind the children not to pack the soil in the cups; the soil should be loose.
  - b. Place each drainage tester over a cup using two craft sticks.
  - c. Fill two cups with 100 ml (1/3 C) of water and set them next to the drainage testers.

## NOTES



[Science Notebook page 18](#)

- Encourage the children to observe the size of the soil parts the two soil samples. (*The children should notice that "Soil A" has more pebbles, while "Soil B" has more sand and silt.*)

### Measuring Drainage

Children measure how quickly water drains through samples of dry and fresh soil.

**+ SAFETY NOTE:** Have children wash their hands before and after handling the soil.

- Explain to the children that they will test the two samples and record their observations in the table on [page 19 of their science notebooks](#). Point out that their "output cups" are marked on the side. The measurements are in cubic centimeters and ounces. One cubic centimeter is the same as one milliliter.
- As the children pour the water into the "input" cups, have them note the time in their science notebooks.
- Call out time intervals at 1 minute, 2 minutes, 5 minutes, then 15, 30, and 60 minutes. The children monitor their drainage testers and record their measurements at the times indicated in their science notebook.

**TEACHER NOTE:** The drainage times vary depending on the soil type. Feel free to have them do other activities between observations. While waiting, consider asking some of the questions in the next optional step.

- (Optional) While waiting for their soils to drain, the children think about other ways they could do the investigation. What other tools could they use? What other methods could they use to measure the time or the amount of water that drains through the soil? Encourage them to draw any new designs they think of in the journal pages at the back of their science notebooks.
- After the last observation, the children measure the total amount of water in each "output" cup and record their measurements on [page 19 of their student notebook](#).

Date: \_\_\_\_\_

**Measuring Soil Drainage**

- What time did you pour water into the "input" cups?  
\_\_\_\_\_
- Record how much water is in each "output" cup.

Time	Soil A	Soil B
1 minute	_____cc	_____cc
2 minutes	_____cc	_____cc
5 minutes	_____cc	_____cc
15 minutes	_____cc	_____cc
30 minutes	_____cc	_____cc
60 minutes	_____cc	_____cc

Measuring Soil Drainage (Lesson 4) 19

[Science Notebook page 19](#)

## Reflect and Discuss

### Sharing

As the children look at the data in their Soils Science Notebook, ask them:

- Which soil sample had more pebble material? ("Soil A") Which had more sand and silt? ("Soil B")
- Which soil sample drained more quickly? ("Soil A") Which drained more slowly? ("Soil B")

**TEACHER NOTE:** The primary reason that more water sticks to the silt than to the pebbles is that the silt contains a lot more surface area than the pebbles. However, it is unlikely that younger students have had much exposure to the idea of surface area and may have a hard time accepting that equal volumes of silt and pebbles would have vastly different amounts of surface area.

### Synthesizing

- Review the class's observations about the relative speed that the different soil parts drained during the demonstration. (The pebbles drained the fastest, followed by sand, with silt being the slowest.)
- Encourage the class to speculate about why the water drained the fastest through the pebbles and the slowest through the silt. If necessary, review with the class the difference in particle size between the different soil parts. Draw models of the particles on the board to illustrate how the water flows through them. (Water seeps through the holes or spaces between the particles. The spaces are largest between the pebble particles and smallest between the silt particles. In fact, the spaces are so large between the pebble particles that they can be seen with the naked eye. Water seeps faster through bigger spaces.)
- Prompt the children to think about how organic matter affects how much water drains or is absorbed by the soil. Will it make it absorb more or less water? (Children's answers may reflect some uncertainty about what kind of organic material is in the soil. Some organic materials, such as soft wood, absorb water like a sponge. Other organic material, such as decomposed leaves, may not absorb as much water.)

## NOTES

### Big Idea

Different types of soils have different abilities to drain and to retain water.

### assessment opportunity

*During the discussion, use the **Properties of Soil Rubric** to check the children's understanding of the lesson's big idea.*

 **NOTES**

*At the end of this lesson, have students reflect on the “I Wonder” circle. How did they wonder, think, try, observe, record, and discover during the exploration?*

- Discuss what kind of soil they think is best (or worst) for certain situations. (For example, when there’s a puddle of water in the yard, it’s probably because the soil has small particles that slow the water’s movement through. Or the soil is already saturated. For crops to grow well, soil must absorb some of the water. But for playing fields, it’s better that the water passes through rapidly. As a result, they usually have sandy soils.)

## Ongoing Learning

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### Science Center

Leave some drainage testers and various materials for children to conduct further explorations about soil drainage. Provide different materials for children to explore, such as clay and compost, to build their understanding the concepts in this lesson.

## Extending the Lesson

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### Further Science Explorations

#### *Can Water Move Upward Through the Soil?*

1. Have the children brainstorm whether plant roots can get water from dry soil. Tell the children that they’ve observed how water moves downward through the soil, but ask them if they think water can move upward through the soil as well.
2. To model how water can move upward for the children, cut the bottom out of a clear plastic cup and cover the opening with a piece of the smallest mesh used in Lesson 3, “Sifting Soil.” Use a rubber band to hold the mesh onto the cup.
3. Fill the cup 3/4 full of dry soil.
4. Fill a pie pan or similar container with water.
5. Hold the cup so that the mesh-covered end is just under the water. The children observe how water moves upward through the soil.
6. Ask the children why this action is important. (*Plants and organisms that live in the soil need water.*) Explain to the children that it is essential that water can move upward through the soil because in dry weather, plant roots must be able to get water or else the roots dry out and the plant dies.
7. With the children, test different types of soil for water’s ability to move upward through them. (*This movement is due to capillary action.*)

### *Modeling Water Drainage*

Using various sizes of dried beans (such as kidney, lima, or black beans.), create several models of different “soils.” One model could have a greater proportion of smaller-size beans while another has a greater proportion of larger-size beans. Demonstrate how water drains through soils differently.

### **Math Extension**

Have the children create bar graphs plotting the drainage time for each group’s data and for the two soil samples. Using this as the basis, go back to their observations from Lesson 3 “Sifting Soil.” The children compare each group’s proportion of soil parts to the drainage time. Can they notice any patterns in the data? (*The soils with high amounts of gravel and sand drained the fastest.*)

## **Planning Ahead**

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### **For Lesson 5**

During the Sensory Observation, you will demonstrate the difference between compact and loose soil. Obtain two fresh soil samples: one that has very little organic material, and another rich in organic material. You might find compact and loose soil among the samples brought in by children. If you cannot find samples with these properties, create your own:

- Mix compost into a soil sample to make it looser and rich in organic material.
- Add silt and clay to a soil sample to make it compact more easily.





The Teacher Background Information in each module brings teachers up to speed on the science content, and provides an overview of research about possible misconceptions students may have.

Here is a portion of the Soils Teacher Background Information.

# Teacher Background Information

This section provides a detailed overview of concepts relevant to the Soils Unit. It is intended to give you background information you may need as you teach the unit; however, it is not necessary to master or present all the content that is offered here. The Key Notes section of each lesson indicates which portion to review prior to teaching the lesson. A quick read-through before teaching the unit—to get the big picture—followed by more focused readings before each lesson should help you guide the children in their discoveries about and explorations of soil.

## Introduction

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Many children believe that soil must have always been in its present form. Indeed, depending on the climate, it can take as long as 1000 years or more to form one inch of topsoil. Because they take so long to create, soils are often considered a non-renewable resource. Once they are lost due factors such as erosion, human activity, and pollution, they cannot be easily replaced.

Soil is formed from the weathering of rocks and the interaction of living organisms such as plants, earthworms, bacteria, and fungi. For example, mosses and lichens produce acids that chemically break down rocks. **Bacteria** and **fungi** in the soil cause the decay of dead plants and animals. Moles, earthworms, ants, and beetles help to break apart large pieces of soil as they burrow through the ground. Their tunnels allow water to move rapidly through the soil, thereby speeding up the weathering of the underlying rock.

Soil also supports living organisms. It provides habitat for animals, fungi, and bacteria. It supplies the minerals and water that plants need to grow.

## Soil Basics

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Soils Lessons 1–4 help children overcome a common preconception that soil is a single substance, rather than one with a variety of components. In addition to **sediment** from weathered rock pieces, all soil includes organic matter, water, and air. Living and dead organic materials typically make up five percent of soil. These proportions vary depending on the area in which the soil is found. By looking closely at multiple soil samples in Lesson 1, “What is Soil?” the children come to understand and appreciate the role of decaying matter in soil and how the organic material in soil is essential to plant growth.

Approximately 25 percent of soil is made up of water, though the amount varies depending on the precipitation in the area and the water holding capacity of the soil. Air also makes up 25 percent of the soil and is essential for the living organisms in the soil and plants. The air and water found in soil fill the spaces between soil particles. These spaces are called pore spaces. Plants and animals use the water and air in these spaces, as well as the minerals dissolved in the water. Pore spaces are also critical for plant roots. In Lesson 4, “Measuring Soil Drainage,” the children consider the **porosity** and **permeability** of different soils.

Last but not least, 45 percent of soil is composed of sediment in the form of pebbles, sand, and silt. In Lessons 1–3, the children examine the different size particles in soil, the sediment.

## Sediment

The most basic classification of sediment grain size includes just three categories: gravel, sand, and mud. For simplicity, the categories are referred to in the lessons as “pebbles,” “sand,” and “silt.” Technically, these materials should be referred to as “pebble-sized,” “sand-sized,” or “silt-sized” material, but these terms are unnecessarily complicated for younger students.

Children often refer to any wet, sticky soil as “mud.” In fact, scientists use the term *mud* to refer collectively to particles that are smaller than sand: silt and clay. Also, scientists don’t distinguish wet mud from dry mud. To help children describe soil particles, the Soils unit uses the term *silt*, instead of mud, to include all particles smaller than sand.

One of the ways of classifying sediment is by the size of the particles of rocky material. Sand, silt, and clay particles are defined by their size. According to the U.S. Department of Agriculture classification system, sizes of rock particles separate as follows:

Very coarse sand	2.0 – 1.0 mm
Coarse sand	1.0 – 0.5 mm
Medium sand	0.5 – 0.25 mm
Fine sand	0.25 – 0.10 mm
Very fine sand	0.10 – 0.05 mm
Silt	0.05 – 0.002 mm
Clay	<0.002 mm

Another way to classify soil is by feeling its **texture**. Soil texture refers to the percentage of sand, silt, and clay particles in a soil. Soil texture has important effects on soil properties. Water-holding capacity, drainage, and chemical properties are just a few examples of properties that are affected by soil texture.

In general, coarse-textured soils (those with lots of sand-sized particles) hold relatively little water and drain rapidly. They are nutrient-poor, and, therefore, less fertile than fine-textured soils.

Fine-textured soils (lots of clay-sized particles) hold relatively large amounts of water. Depending on their structure, they may be well drained, poorly drained, or inhibit drainage altogether. Their fertility can be high or low, depending on the types of clay particles present.

When the children feel the different types of soil between their fingers, and examine the sediment more carefully (when using hand lenses and when pouring water through), encourage them to notice the some of the following properties of the small sediment.

### *Sand Particles*

- Gritty to the touch.
- Hard with sharp edges (view with hand lens).
- Visible to the naked eye.
- Loose and crumbly.
- Not good for retaining water.
- Do not pack together well unless water is added. Water fills the pore spaces between the grains of sand and the water's surface tension holds the sand grains together.

### *Silt (and Clay) Particles*

- Soft and smooth to the touch.
- Hold together well.
- Compact to some degree.
- Slippery.
- There is little pore space between them, so water cannot easily penetrate.
- Easily carried by wind when dry.

### **Pebbles**

As noted above, the Soils unit refers to particles larger than sand as **pebbles**. Scientists also refer to this size of rock particle as gravel. In general, pebbles are rock pieces that are larger than sand, but smaller than cobbles. Soil may also contain larger rocks, such as stones and boulders. Because of their large size, however, it is unlikely that children's soil samples will include any cobbles, stones, or boulders.

When children collect their soil samples for Lesson 1, they will probably leave behind these larger rocks. The size of pebbles that children discover in their soil samples will depend on the geology of your locale. Scientists designate pebbles according to these sizes listed in the following table.

Coarse pebbles	20.0 – 64.0 mm
Medium pebbles	8.0 – 20.0 mm
Fine pebbles	4.0 – 8.0 mm
Granules	2.0 – 4.0 mm

Pebbles come in a variety of shapes and textures. Those that have been well weathered may be smooth and round. Less-weathered rock pieces may be rough and have edges. If you teach the Rocks unit, it might be interesting to children to carefully examine and try to identify the type of rock found in their soil samples.

## Organic Material

Organic material is anything that was once alive, but is now in or on top of the soil. Piles of leaves and animal manure are examples of organic material. Organic material includes the following:

- living organisms, such as plants, animals, fungi and bacteria
- dead plants and animals
- nutrients that have come from decomposed plants and animals

Once organic material breaks down it becomes organic matter, or **humus**. Humus is the final product of organic decomposition. It is the dark brown or black, nutrient-rich material formed from decomposed plant and animal matter.

Organic matter makes up only a small fraction of the total materials in soil, yet it is extremely important. Organic matter stores nutrients for use by plants and helps prevent soil compaction. It is also an important component of fertile soil because it has a high water absorption and swelling capacity. In other words, it helps soil store water, making it available for plant roots and animals, such as earthworms. (Children observe absorption in different soil samples in Lesson 4.) Organic matter tends to be found in the upper parts of soil layers, whereas clays tend to accumulate at deeper levels. (See the “Soil Horizons” section on page 106.)

## Other material

As the children may discover when they obtain their own soil samples for Lesson 1, soil may also contain human-made materials. Sometimes these materials are obvious, such as plastic soda bottle tops, or pieces of broken glass. These materials are often introduced to soil accidentally, as trash.

But sometimes human-made materials in soil may not be easy to discern. Wherever humans interact with their environment, they are likely to introduce materials to the soil. For example, when building houses and roads, construction workers might scatter rocks and cement. When farmers work the soil, they may add fertilizers.

While these other materials are not the subject of this unit, once children begin to look more closely at soil, they may ask questions about these human contributions to the soil. Build on this interest by asking children to think about how their activities affect soil. Consider having them pursue a class project in which they look at cleaning up the soil at school or in their community.

## Soil Drainage

Soil drainage is usually determined by soil texture (the size of soil particles). Water and air—found in the pore spaces between soil particles—help to support plant growth.

The ideal soil is a combination of sand, silt, and clay. Sand provides fast drainage and good aeration (high permeability), but does not hold water very well. Clay is good for its water holding ability, but its small empty spaces limit the supply of air to the soil. Because of its low permeability, clay can inhibit drainage. As water fills the spaces between soil particles, it drives out air. In soils with a high proportion of clay, water remains a long time in the pore spaces and the roots are deprived of oxygen for many hours. With some plants, this temporary lack of oxygen is very damaging. Thus, it is easy to drown plants in a clay soil.

Children explore the property of soil drainage in [Lesson 4](#).

## Soil Horizons

---

When children dig in their gardens to obtain soil samples or when they drive past road-cuts, they may notice that soil occurs in layers, called **horizons**. Knowing about soil horizons is not essential to the Soils Unit, but you may find it helpful in teaching the children about soil as a resource.

# Student Science Notebook

**The Science Notebook** is a student's ongoing record of his or her work as a scientist. Each Science Companion module for grades 1-6 has a Student Science Notebook tailored for that module.

Student Science Notebooks are age-appropriate. Notebooks for younger grades contain minimal text and opportunities to draw instead of write, so all students can participate and shine as scientists. For older grades, Student Science Notebooks utilize students' developing skills: they contain procedures for students to follow, and provide support for controlling variables as students develop their own experiments—all leading to increased independence.

All the Student Science Notebooks develop literacy and support mathematics skills. Students apply these disciplines in the highly motivating process of doing science.



Science Companion<sup>®</sup>

[www.sciencecompanion.com](http://www.sciencecompanion.com)

Date: \_\_\_\_\_

Hello Scientist,

All scientists like to study things carefully. They like to think and ask questions. They try things out and then see what happens. They use their senses to observe things. They describe their observations with pictures and words.

Scientists use science notebooks to write and draw their ideas and their observations about the things they study.

This is your science notebook. You will write and draw some of your ideas and your observations here.

Enjoy it!

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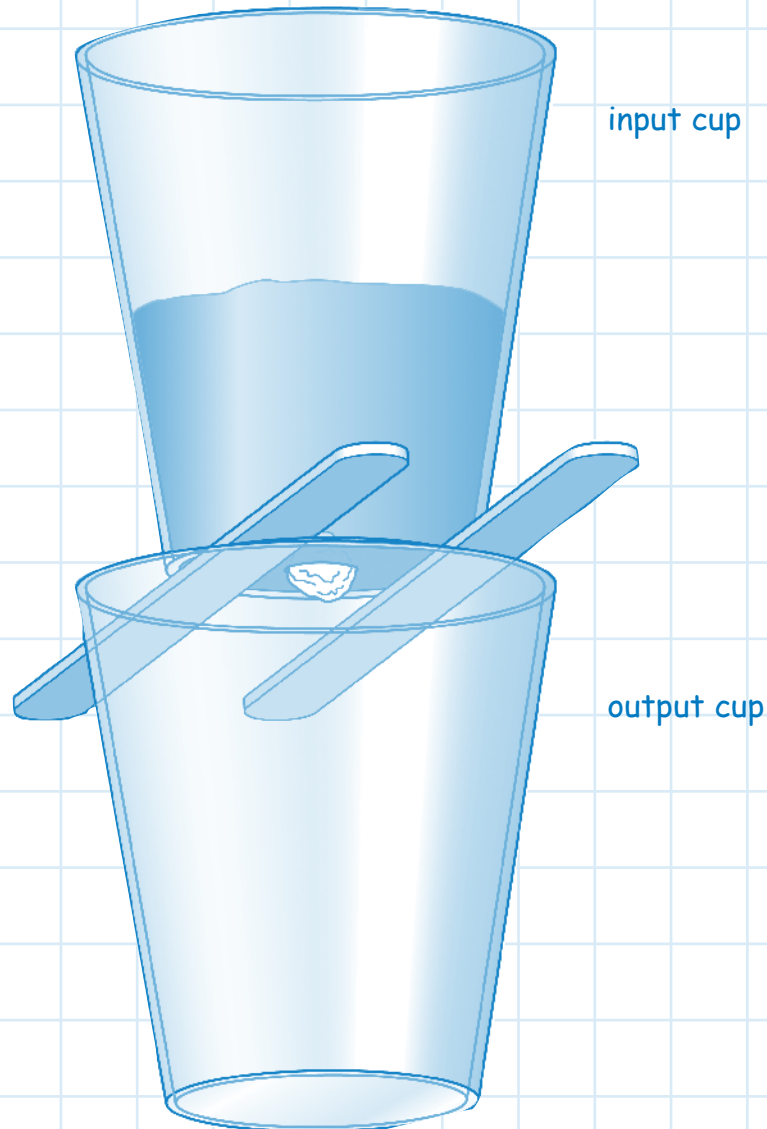
Hello Scientist

Date: \_\_\_\_\_

## Building Drainage Testers

Follow along as your teacher shows you how to make drainage testers.

You will make one drainage tester to test "Soil A," and one to test "Soil B."





Date: \_\_\_\_\_

## Measuring Soil Drainage

1. What time did you pour water into the "input" cups?

\_\_\_\_\_

2. Record how much water is in each "output" cup.

Time	Soil A	Soil B
1 minute	_____cc	_____cc
2 minutes	_____cc	_____cc
5 minutes	_____cc	_____cc
15 minutes	_____cc	_____cc
30 minutes	_____cc	_____cc
60 minutes	_____cc	_____cc

# Assessments

Science Companion supplies a variety of tools to assess children “in-the-act” of doing science, as well as evaluate their understanding and proficiency as they finish clusters of lessons.

## In the Teacher Lesson Manual:

Big Ideas and lesson goals are clearly outlined on each lesson’s Quick Look pages.

Assessment Options in each lesson suggest where pre-assessment and formative assessment can occur in the context of a lesson.

## In the Assessment Book:

**Rubrics** are supplied to score understanding of science content. The criteria in each rubric are derived from a module’s Big Ideas and lesson goals.

**Opportunities Overviews** show where each criteria can be evaluated during pre-assessment, formative assessment and summative assessment.

**Checklists and Self-Assessments** list criteria that are related to science process skills.

**Performance Tasks** are used for summative assessment to evaluate students’ understanding of Big Ideas and lesson goals. The Assessment Book supplies evaluation guidelines and blank masters for each Performance Task.

**Quick Checks**—another summative assessment tool—employ a multiple-choice format.

## The Science Notebook Teacher Guide:

A final assessment tool is the Science Notebook Teacher Guide. This teacher edition of the Student Science Notebook is annotated to help teachers know what to expect in from children in their Student Science Notebooks.

Rubrics return to the Big Ideas and show how to evaluate student progress.

## Rubric 1: Properties of Soil

	Criterion A (Lessons 2-4)	Criterion B (Lessons 1-5)	Criteria C and D (Lesson 5)
	<b>Soil is composed of different amounts of pebbles, sand, silt, clay, and organic material.</b>	<b>Soil and its components can be compared and classified based on different properties.</b>	<b>Earthworms return nutrients to the soil and improve soil quality.</b>
<b>4 - Exceeds Expectations</b> Explores content beyond the level presented in the lessons.	Understands at a secure level (see box below) and shows an interest in discovering why different soils contain different amounts of these materials.	Understands at a secure level (see box below) and shows an interest in investigating the composition of different types of soil.	Understands at a secure level (see box below) and extends understanding by exploring how other animals and insects can improve soil quality.
<b>3 - Secure (Meets Expectations)</b> Understands content at the level presented in the lessons and does not exhibit misconceptions.	Understands that soil is composed of different amounts of pebbles, sand, silt, clay, and organic material.	Understands that soil and its components can be compared and classified based on properties such as particle size, texture, and color.	Understands that earthworms loosen the soil and return nutrients to the soil by breaking down plant material.
<b>2 - Developing (Approaches Expectations)</b> Shows an increasing competency with lesson content.	Understands that soil is composed of pebbles, sand, silt, clay, and organic material, but does not know that different soils contain different amounts of these materials.	Understands that soil is composed of different materials but has difficulty using properties to compare and classify those materials.	Understands that earthworms improve soil quality but cannot explain how.
<b>1 - Beginning</b> Has no previous knowledge of lesson content.	Does not understand what materials make up soil.	Does not recognize that soil components have different properties.	Does not understand that earthworms improve soil quality.

Opportunities Overviews show where ongoing and summative assessment can occur for each criteria.

## Opportunities Overview: Properties of Soil

This table highlights opportunities to assess the criteria on Rubric: Properties of Soil. It does not include every assessment opportunity; feel free to select or devise other ways to assess various criteria.

	Criterion A (Lessons 1-4)	Criterion B (Lessons 1-5)	Criteria C and D (Lesson 5)
Pre and Formative Opportunities	<p><b>Lesson 2:</b></p> <ul style="list-style-type: none"> <li>- Introductory discussion</li> <li>- Exploration</li> <li>- Synthesizing discussion</li> <li>- Science notebook pages 6-13</li> </ul> <p><b>Lesson 3:</b></p> <ul style="list-style-type: none"> <li>- Exploration</li> <li>- Science notebook pages 14-17</li> </ul> <p><b>Lesson 4:</b></p> <ul style="list-style-type: none"> <li>- Synthesizing discussion</li> <li>- Science notebook page 19</li> </ul>	<p><b>Lesson 1:</b></p> <ul style="list-style-type: none"> <li>- Exploration</li> <li>- Synthesizing discussion</li> <li>- Science notebook pages 2-5</li> </ul> <p><b>Lesson 2:</b></p> <ul style="list-style-type: none"> <li>- Introductory discussion</li> <li>- Exploration</li> <li>- Synthesizing discussion</li> <li>- Science notebook pages 6-13</li> </ul> <p><b>Lesson 3:</b></p> <ul style="list-style-type: none"> <li>- Exploration</li> <li>- Science notebook pages 14-17</li> </ul> <p><b>Lesson 4:</b></p> <ul style="list-style-type: none"> <li>- Synthesizing discussion</li> <li>- Science notebook page 19</li> </ul> <p><b>Lesson 5:</b></p> <ul style="list-style-type: none"> <li>- Introductory discussion</li> </ul>	<p><b>Lesson 5:</b></p> <ul style="list-style-type: none"> <li>- Exploration</li> <li>- Synthesizing discussion</li> </ul>
Summative Opportunities	Performance Tasks		
	<p>“Guess My Soil Part,” page 26</p> <p>Suspending Soil, page 27</p> <p>The Puddle, page 28</p> <p>Soil Story, page 29</p>	<p>“Guess My Soil Part,” page 26</p> <p>Suspending Soil, page 27</p> <p>The Puddle, page 28</p> <p>Soil Story, page 29</p>	<p>Worms in the Garden, page 29</p> <p>Soil Story, page 30</p>
	Quick Check Items		
<p>Pages 32-36: items 3, 4, 5, 6, 7, 8, 9, 11, 13</p>	<p>Pages 32-36: items 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13</p>	<p>Page 36: item 12</p>	

# Checklist: Observing and Describing

## Teacher Assessment

(Lessons 1-4)

**TEACHER NOTE:** Students use observing and describing skills extensively throughout the unit. Lesson 1 presents an excellent opportunity to pre-assess these skills.

Determine whether the following skills are evident as the students make observations and descriptions. You might want to assign one point for each criterion that a student demonstrates. You can add specific observations or comments in the space below each criterion.

Name \_\_\_\_\_

Date \_\_\_\_\_

### Criteria:

\_\_\_\_\_ A. Observations, descriptions and drawings are accurate; they reflect actual properties or events.

\_\_\_\_\_ B. Observations, descriptions, and drawings show or describe details.

\_\_\_\_\_ C. Uses multiple perspectives when making observations.

Name \_\_\_\_\_ Date \_\_\_\_\_

## Self-Assessment: Observing and Describing

Think about your observations, descriptions, and scientific drawings. Answer the following questions.

1. Do you make careful observations?

Always

Sometimes

Seldom

2. How much detail do you include in your observations, drawings and descriptions?

A lot of detail

Some detail

Very little detail

Give some examples of when you included details in your observations:

3. If you had more time to make observations, drawings, or descriptions, what else would you include?

# Checklist: Using Science Tools

## Teacher Assessment

(Lessons 2- 4)

**TEACHER NOTE:** Students use basic tools to conduct their investigations in Lessons 2 and 3. They assemble and use simple equipment in Lessons 3 and 4.

Determine whether the following skills are evident as the student uses science tools. You might assign one point for each criterion that the student demonstrates. You can add specific observations or comments in the space below each criterion.

Name \_\_\_\_\_

Date \_\_\_\_\_

### Criteria:

\_\_\_\_\_ A. Uses basic tools (for example, magnifying lenses) to extend the senses.

\_\_\_\_\_ B. Uses simple equipment (such as soil suspension jar) to gather data.

\_\_\_\_\_ C. Assembles simple science equipment (such as soil sifter and soil drainage apparatus) and uses it to conduct an investigation.

Name \_\_\_\_\_ Date \_\_\_\_\_

## Self-Assessment: Using Science Tools

Think about your use of science tools and equipment. Answer the following questions.

1. How well do you use basic tools (for example, magnifying lenses) to extend your senses?

Very well

Okay

Not very well

2. How well do you use simple equipment (such as soil suspension jar) to gather data?

Very well

Okay

Not very well

3. How well can you put together and use simple science equipment (such as soil sifter and soil drainage apparatus)?

Very well

Okay

Not very well

4. Give some examples of when you used simple basic tools or simple equipment:



# The Puddle

(Lesson 4)

Here's a sample of a  
Performance Task.

Fred noticed a puddle of water when he walked home from school.

After two days without rain, he noticed that the puddle was still there.

After two days without rain, he saw a layer of smooth, sticky material where the water had pooled. That material was finely textured.

Fred wants to know what the soil is like where the puddle used to be.

1. Describe to Fred what is mostly in the soil.

## TEACHER NOTE:

Use this assessment after teaching Lesson 4.

## EVALUATION GUIDELINE:

Children should note that the soil has more materials that do not drain quickly, such as clay and silt.

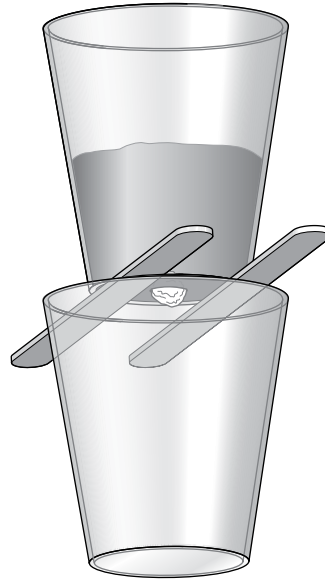
2. How can you tell this from Fred's observations?

## EVALUATION GUIDELINES:

Children should note these observations made by Fred:

- The puddle itself means that the soil drains poorly.
- The water is still there after two days, further indicating poorly draining soil.
- The layer of smooth, sticky, and finely textured material has the same properties as clay and silt.

10. (Lesson 4) What can you do with this tool?



- a. measure how thick soil is.
  - b. *observe how water drains through soil.*
  - c. test how many pebbles are in soil.
  - d. cause soil to settle into different layers.
11. (Lesson 4) Water drains fastest through which soil?
- a. soil with mostly silt and sand.
  - b. soil with mostly clay and organic material.
  - c. *soil with mostly pebbles.*

# ExploraGear®



## ExploraGear® Items

The ExploraGear® provides all of the hard-to-find, hands-on materials needed to effectively implement a Science Companion module. This kit of non-consumable and consumable items is your go-to place for the tools needed to teach inquiry science. The authors of Science Companion carefully developed the curriculum so that the ExploraGear® items are not overwhelming and unfamiliar, but filled with the most essential, high quality items needed to engage students in a rich, interactive, inquiry science experience.

# Science Companion®

[www.sciencecompanion.com](http://www.sciencecompanion.com)

# "I Wonder" Circle®

## Doing Science

Science Companion uses the "I Wonder" Circle to help students reflect on how they (and other scientists!) do science.



**I Wonder:** notice, ask questions, state problems

**I Think:** consider, gather information, predict

**I Try:** experiment, model, test ideas, repeat

**I Observe:** watch, examine, measure

**I Record:** record data, organize, describe, classify, graph, draw

**I Discover:** look for patterns, interpret, reflect, conclude, communicate discoveries

**ScienceCompanion®**  
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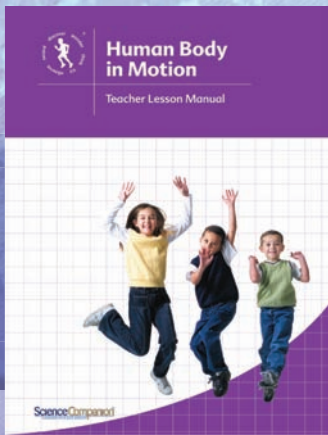
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# I Wonder...

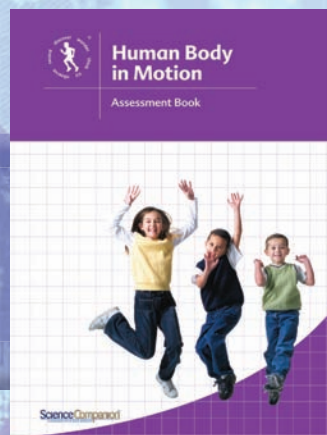
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### For the Teacher

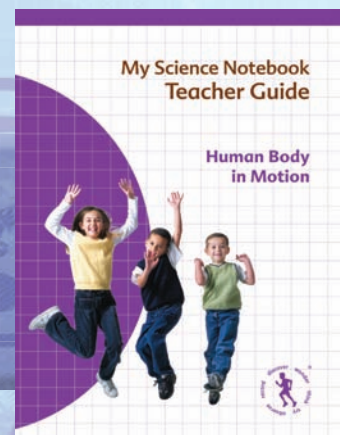
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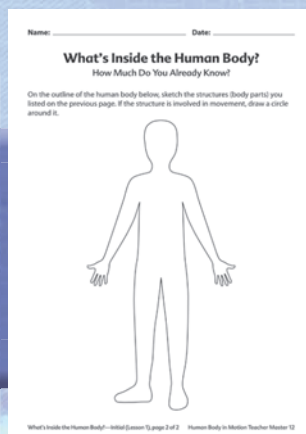


Student Notebook  
Teacher Guide

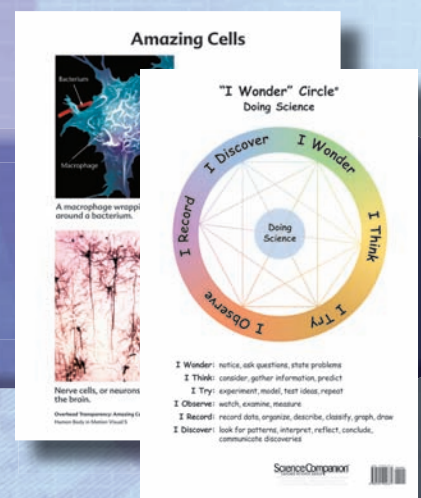
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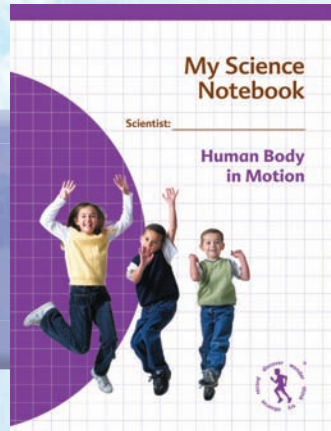
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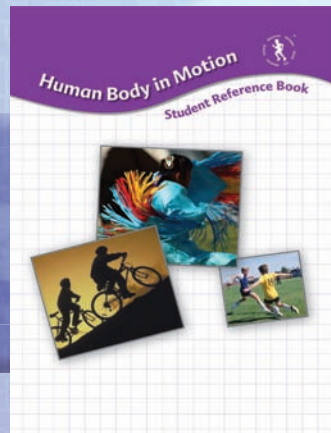


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# PreK-6 Inquiry Science Curriculum

*Inspiring students to explore their world.*

Early Childhood



## Rainbows, Color, and Light

Through experiments with prisms, mirrors, bubbles, water, sunlight, and flashlights, children bring rainbow effects into their classroom and onto the playground. They also mix colors to observe that colored light produces different results than mixing pigmented paints, dough, or water.

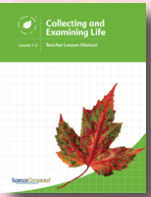
Early Childhood



## Early Science Explorations

From making a collage of the leaves and seeds they find to constructing a lever from rocks and wood, children are introduced to the wonders of science and scientific exploration. Contains 7 studies in one book: *Growing and Changing*; *Class Pet*; *Collections from Nature*; *Constructions*; *Dirt, Sand and Water*; *Sky and Weather*; and *My Body*.

Life Science



## Collecting and Examining Life

From collecting animal tracks to dissecting flowers, children deepen their understanding of what makes something alive as well as exploring the similarities and differences among living things.

Earth Science



## Weather

One day students learn to use a thermometer to record temperature, another day they measure rainfall or investigate the nature of ice. Throughout the year, students use their senses as well as scientific tools to discover that weather is a dynamic part of nature.

Physical Science



## Solids, Liquids, and Gases

While deciding what makes a solid a solid, watching water disappear from an open cup, or comparing various liquids, children find the value in asking questions and probing the world around them for meaningful answers.

Physical Science



## Magnets

From testing what sort of everyday objects are attracted to magnets to comparing the strength of different magnets, children deepen their observation skills while learning about the nature of magnets.

Physical Science



## Motion

Through activities that engage children's bodies and minds, children move their own bodies in various ways to learn about motion, as well as build ramps, roll toy cars, drop and crash marbles, slide pennies and shoes, and even fly paper airplanes.

Earth Science



## Rocks

One day children examine fossils, another day they might test minerals. As children collect, examine, describe, and experiment with rocks, minerals and fossils, they hone their observation skills and begin to unravel the puzzle of what rocks are and how they are formed.

Life Science



## Life Cycles

From watching a pea sprout to feeding apples to butterflies, children closely study four organisms, including humans, to observe the remarkable growth and change that living things experience during their life spans.

Earth Science



## Soils

From closely observing soil components and their properties to discovering the importance of earthworms, children use their senses of sight, smell, and touch to explore the wonders of soil.

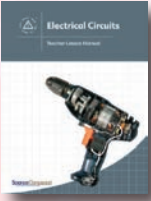
Life Science



### Habitats

From going on a nature walk to dissecting owl pellets, children are asked to think about how organisms (plants, animals, fungi, and microscopic living things) survive in the places they live, and how they interact with other living things.

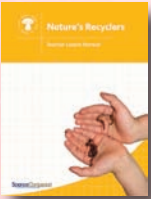
Physical Science



### Electrical Circuits

Whether exploring static charges, figuring out how to get a light bulb to light, or testing the conductivity of everyday objects, students experience firsthand the excitement of electricity and scientific discovery.

Life Science



### Nature's Recyclers

By watching composting worms create soil, to modeling the nutrient cycle, students have the opportunity to investigate the organisms that carry out the process of decomposition and recycle nutrients in an ecosystem.

Earth Science



### Earth's Changing Surface

From building river models that explore erosion and deposition to touring the school grounds looking for evidence of the earth's changing surface, students use hands-on investigations to discover the dynamic nature of the earth's surface.

Life Science



### Human Body in Motion

By modeling how muscles move bones, testing reflexes, and measuring the effects of exercise on breathing and heart rate, students begin to appreciate the interactions between body parts and recognize the importance of protecting them by making healthy choices.

Physical Science



### Force and Motion

By demonstrating and explaining ways that forces cause actions and reactions, as well as gaining a deeper understanding of basic forces such as friction and gravity, students discover the many ways that forces affect the motion of objects around them.

Building Skills



### Science Skill Builders

With 21 lessons spanning the breadth and depth of science skills, students develop a core understanding of using tools in science, scientific testing, observation skills, and the importance of analysis and conclusions.

Physical Science



### Light

Whether watching light "bend" a pencil in water or building a periscope, the combination of hands-on, multi-sensory learning enables children to understand what light is, how it behaves, and why it makes sight possible.

Earth Science



### Our Solar System

One day children chart the moon's cycles, another day they might make a scale model of our solar system. By observing the world around them, they address questions such as "Why are there seasons?" and "Why does the moon appear to change shape?"

Earth Science



### Watery Earth

Whether following a drop of water through the water cycle, measuring their own water usage, or exploring how filters clean dirty water, students are encouraged to use what they learn to have a positive impact on water resources.

Physical Science



### Matter

With challenges like exploring what they can learn about an unknown substance called "Whatzit," students experience the excitement of scientific discovery and gain an appreciation of the scientific method used by professional scientists.

Physical Science



### Energy

Whether testing the efficiency of light bulbs, exploring heat conduction, or designing an imaginary invention demonstrating the transfer of energy, students discover that energy is at the root of all change occurring in the world around them.

Technology



### Design Projects

*Animal Homes, Human Tools, Simple Machines, Moving Systems, Electrical Circuits, Human Systems.*  
The design project series was developed to support compatible modules by allowing students to design and/or build animal homes, tools, machines, and designs of their own creation. Taking between 4-6 sessions, the projects strengthen skills and ideas about choosing materials, using tools, working with the limitations of materials, solving problems, and overall project design.



# Unique Features...

Program Features	FOSS	Science Companion	STC
Prepares students to do <b>inquiry-based science</b>		✓ Lesson O introduces students to the scientific method through the “I Wonder” Circle	
Hardback, colorful, content-rich <b>student reference materials</b> for upper elementary students		✓ Student Reference Books	
Bound <b>student science notebooks</b> to foster student literacy and reading skills	✓	✓ The original Student Science Notebooks	
Parallels in instructional design to <b>Everyday Mathematics®</b>		✓ Developed by the creators of <i>Everyday Mathematics®</i>	
Variety of <b>assessment strategies</b>	✓	✓ Teacher-friendly formative and summative assessment strategies	✓
A variety of <b>pilot options</b> to fit the interests and needs of districts		✓ Several no-cost pilot options, including an innovative online pilot program	
Correlations to <b>local and state science standards</b>		✓ Correlated to state standards with customized local standard correlations available upon request	
Teacher must gather <b>minimal teacher supplied items</b>	✓	✓ ExploraGear and Supplemental Classroom Supplies available	✓
<b>Early Childhood</b> activity-based modules available	✓ (K Only)	✓ Modules developed specifically for PreK-K available	
Unique <b>content</b> offered to meet standards		✓ <i>Light and Rainbows, Color, and Light</i> modules available	
Children develop science <b>habits of mind</b> in addition to content knowledge		✓ “I Wonder” Circle integrates modules as tool for student reflection	
<b>Engaging activities</b> nourish children’s curiosity	✓	✓ Engaging, hands-on activities focused on Big Ideas	✓
Supports teachers in reaching <b>Big Ideas</b>		✓ Reflective Discussions help children integrate their experience and build science knowledge	
<b>Full curriculum available digitally</b>		✓ Hyperlinked teacher materials (iTLM’s) & digital student materials build affordable access	

# A New Way to Pilot...

## *An Innovative Free Online Pilot Program!*

We know that both time and financial resources are limited for school districts these days.

So, we are delighted to introduce an exciting new digital opportunity for you to try Science Companion materials at no cost, at a scale that is easily manageable. And it's high tech, too!

Come to our Online Pilot Website and find:

- Sample lessons from eight of our modules.
- Conversation and support from content and teaching experts.
- Free digital teacher materials and student resources.
- Directions on how to order 'lending library' for kit materials.
- A pilot that will give you a rich taste of inquiry science but requires no more than a handful of classroom sessions.

*"I think this is an awesome resource for doing science."*

*Field Test Teacher*

There are a limited number of online pilots available, so contact us now to find out how you can explore Science Companion at your pace, for free.

(And, of course, we have traditional pilots available too. Just ask!)

**Science Companion**<sup>®</sup>  
[www.sciencecompanion.com](http://www.sciencecompanion.com)

888-352-0660  
[pilot@sciencecompanion.com](mailto:pilot@sciencecompanion.com)

# Professional Development

## Succeed with Science Companion

*Inquiry-based learning in science is exciting, effective, and evocative. It also can be challenging. We can help you take the mystery out of inquiry!*

### **Philosophy**

*A half-day session introducing the methodology, pedagogy, and best practices of Science Companion.*

### **Implementation**

*Building from specific modules your district is using, a hands-on exploration of how to best implement Science Companion in your classrooms.*

### **Assessment and Science**

*Formative and summative assessment can work together to strengthen teaching and test scores!*

### **Coming from Everyday Math**

*Science Companion was developed by the same researchers who developed Everyday Mathematics, and many of the same pedagogical tools are used. Making the jump to Science Companion is easy!*

### **Train the Trainers**

*Build a community of Science Companion experts in your district or intermediate unit.*

### **It's in the Bag!**

*Fully customizable workshops to meet your needs. Contact us to learn how we can best help you!*

**Designed by the University of Chicago's Center for Elementary Math & Science Education.**

### **Participants**

Teachers and administrators in districts using Science Companion.

### **Length**

Mix and Match to your needs to build a half day or full day session.

### **Continuing Education**

CEU's available, please ask us about we can work with you to arrange credits.

### **Cost**

Ask your rep for more information!

*The spirit of inquiry. An invitation to curiosity. The tools for success.*

# Contact Us!

Get a Full Curriculum Sample

Check out a Pilot Program

Get a Custom Scope & Sequence

Find your Sales Rep

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Click either link  
for more  
information!

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