How Dirt Works Student

 Team

*Work with your team members to complete all* Date Started

*of the sections in this document to answer* Date Completed

*the following essential questions…*

* Why is soil a valuable resource?
* In what different ways do humans rely on soil?
* Why is it important to monitor and maintain the health of soil?
* What specific strategies are used to maintain and improve the health of soil?

What comes to mind when you think of soil? In the list below, rank how soil is important to you.

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| Soil is most important to me because: |

**Watch the video** “How Dirt Works” (4min.) <http://vimeo.com/77792712>

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| **Write 2 focus questions** that this video answers. After each question, write an answer that includes specific references to the video. |

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| What is the organic matter that is in soil? Read the section “**Soil Organic Matter”** the article *The Living Soil*. Begin by copying the circle graph into the space to the right. Below the graph write your source information. <http://www.ext.colostate.edu/mg/gardennotes/212.html>Summarize what each category means.\*\*\*\*What is humus?In your own words, list two ways that humus is important to healthy soil.1)2)Suppose you have collected 150 grams garden soil. About how many grams of each category would you expect to find? |  |
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* **CHECKPOINT – Check with your teacher before moving to the next section.**
* **Teacher Initials: .**

**INVESTIGATION: How do soils regulate water?**

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| **Soil Regulates Water** - Soils help to regulate the flow of water from rain. Some water will flow over the surface, some will enter the soil and be retained and some will flow almost straight through to deeper layers below. Much of the water reaching the soil is stored in the soil and is used by the plants that grow in the soil and by the organisms that live in the soil.**Question:**  Which soil will hold the most water?**Hypothesis**: I predict that more water will be absorbed the soil than the  sample and the sample because:**Materials*** At least 100 ml Garden soil sample, and two other samples which the class agrees upon.

Suggested materials are sand, clay, potting soil mix, compost, gravel* Pushpin
* 3 paper cups
* 100 mL beaker to measure dry material
* Small funnel
* 2 - 100 mL graduated cylinders
* Water
* Timer

**Procedure**1. Use a push pin to punch 3 holes in the bottom of three paper or plastic cups cups.
2. Set up an empty graduated cylinder with a funnel in the top.
3. Use the beaker to measure 100 mL of the first soil sample and pour it into the first cup.
4. Measure 100 ml of water into the 2nd graduated cylinder.
5. Place the cup with the first soil sample over the funnel and empty graduated cylinder.
6. Gradually pour 100 mL of water into the cup with soil.
7. Start the stopwatch when you pour the water in the cup.
8. Measure and record the amount of water dripping from your cup every minute for 5 minutes.
9. After the 5 minutes are up, remove the cup of material from above the graduated cylinder.
10. Measure and record the total amount of water that dripped into the graduated cylinder.
11. Record any other relevant observations, questions, or details.
12. Repeat steps 2-11 for your other 2 soil samples.
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**Data Table** *Create a table in the space below*

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| % air space |
| Sample | water escaped(ml) | Observations, notes, questions | water absorbed(ml) | air space in soil (cc) | % air space in dry soil |
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**Results**

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| Calculate how much water each material was able to absorb, and record above. Remember you started with 100 ml.Next, calculate the air space in the soil sample that the water displaced and record above. *Background: In the metric system1milliliter (ml) = 1 cubic centimeter (cc or cm2).* Write your answers here in equation form.Finally, calculate the percent of air space in the original soil sample. |

**Conclusion**

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| **Restate** your **question** and **hypothesis**: **Summarize** your findings by including your lowest and highest data and average results:**Explain why** you think this is so based on evidence and science principles: |

**Comparing with the rest of the class: How much air space is in our garden soil?**

**Collect data from every other group; and record it in a data table below.**

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| **Air Space in Garden Soil – Class Results** |
| Group # | sample type | air space (cc) | % airspace |  | Group # | sample type | air space (cc) | % airspace |  |
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| Calculate the average air space in our school garden soil and record it below. |
| **Connect to the bigger picture.** Why is it important that soils have air space? Why is it important that soils other than gardens regulate water?What are ways that air space in garden soil can be either improved or maintained? |

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**Meet a Soil Scientist**

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| What are 3 questions you might ask a soil scientist?1.2.3. |

**Watch the video** *Meet the Scientist: Sophie Parker* (1:08 min) <http://vimeo.com/77788834>

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| Describe three “take-aways” from this video.1.2.3. |
| **Watch the video** [Soil #1: Valuable Resource](http://vimeo.com/78368785) to answer the question below. <https://vimeo.com/78368785> (0:50 min)“Why is soil a valuable resource?” In your response, include specific information from your earlier readings and/or investigations. |

**Investigation: Create a model** that shows how water filters pollutants.

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| **Pollutants** are substances they are introduced into the environment, like chemicals or waste. They can contaminate the water, soil, and atmosphere. **Task: Create a model** showing how soil can filter pollutants.**Materials*** 5-oz cup
* 3-oz cup
* Soil sample
* Push pin
* Graduated cylinder
* 50ml beaker
* 30 ml grape Koolaide
* Stopwatch/Timer

**Procedure**1. Use your push pin to poke holes approximately 0.5 cm apart in the bottom of your 5 oz. cup.
2. Put a layer of sand the width of your pointer finger in the bottom of a 5 oz. cup.
3. About how many centimeters is this 1-finger measure? .
4. Add topsoil until the cup is half-full.
5. Put the 5 oz. cup into the 3 oz. cup.
6. Slowly pour about 10 ml of the grape Kool-Aid (pollution) into the top cup.
7. Wait 10-15 seconds.
8. Repeat # 6 and # 7 until liquid begins to collect in the bottom cup.
9. Record your results below.

**Results**1. What color is the Kool-Aid that goes into the cup?
2. What color is the water that collects in the bottom cup?

**Conclusion**1. What property of soil does this demonstrate?
2. How can you explain these results with what you have learned so far?
3. What further questions remain unanswered?
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**Group Discussion** – What does soil mean to different people?

**Goal**: Analyze a situation from different viewpoints.

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| **Procedure** 1. In your group, do a Whip-Around Brainstorm for what soil might mean to a farmer.
2. After the group completes a circuit and everyone has a chance to share;
3. Take 1 minute for each person to record ideas.
4. Repeat steps 1-3 for each of the 9 different groups.
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Soil means something different for each of us. What do you think soil means to a:

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| 1. Farmer?
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| 1. Construction worker?
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| 1. Civil engineer?
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| 1. Geologist?
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| 1. Earthworm?
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| 1. Owner of a dry-cleaning business?
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| 1. Bird?
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| 1. Hydrologist?
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| 1. Maple tree?
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**Tic-Tac-Toe Notes-How do Humans Rely on Soil?**.

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| **Watch the video** [Soil #2: Humans and Soil](http://vimeo.com/78368784/) (0:50 min) <http://vimeo.com/78368784>To answer the question: **“How do humans rely on soil?”** As you watch, put each example that is shared into anyone of the spaces below on the tic-tac-toe board. If you don’t fill up your board by the end of the video, fill in remaining boxes with other examples your group comes up with |
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Draw a straight line through any three boxes – just like you would do in a tic-tac-toe game.

Use these 3 examples to write one sentence explaining how humans rely upon soil.

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**Why is it important to monitor the health of the soil?**

**Watch the video** Soil #3 (0:47 min) to answer this question. <http://vimeo.com/78368788>

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| **Extra Credit** ResearchWhat was the **Dust Bowl**? How did farming practices of the time and weather events combine to help create the Dust Bowl? |

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**Watch** the scientist **video** Soil Strategies #4 (1:04) <http://vimeo.com/78368782> to answer the question:

“**What are some of the strategies used to improve and maintain the health of soil?”**

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| After Viewing Questions:Identify at least 2 strategies.1.2.Which of these strategies is something you have seen in practice? Explain. |

**Final Question:** How does all this relate to our work in our school garden?

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| What are some techniques and or practices that we can adopt in our school garden to best take care of our soil? **Brainstorm** a list with your group. |
| Choose one strategy and write an argument (scientific claim).  |

Summary Sentence: