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| **Lesson Title : Exploring Soil Profiles and The Composition/Properties of Soil Horizons** | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **1** |
| **Activity Title: Introduction to Big Idea (Jack and Jill) Exploring Soil.** |

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| **Estimated Lesson Duration:** | **7 days** |
| **Estimated Activity Duration:** | **2 days** |

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| **Setting:** | **Classroom (Science Lab) / Outside of School** |

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| **Activity Objectives: Infer why some people extract drinking water from the ground. Create a soil profile. Identify and describe the horizons of a soil profile by the horizons composition.** |

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| **Activity Guiding Questions: Is water that comes from deep in the ground safe to drink? What is a soil profile? Are all soil profiles the same across the world?** |

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| Asking questions (for science) and defining problems (for engineering) | Patterns |
| Developing and using models | Cause and effect |
| Planning and carrying out investigations | Scale, proportion, and quantity |
| Analyzing and interpreting data | Systems and system models |
| Using mathematics and computational thinking | Energy and matter: Flows, cycle and conservation |
| Constructing explanations (for science) and designing solutions (for engineering) | Structure and function. |
| Engaging in argument from evidence | Stability and change. |
| Obtaining, evaluating, and communicating information |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| Demonstrating Science Knowledge **(D)** |
| Interpreting and Communicating Science Concepts **(C)** |
| Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or**  **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| Make sense of problems and persevere in solving them | Useappropriate tools strategically |
| Reason abstractly and quantitatively | Attendto precision |
| Construct viable arguments and critique the reasoning of others | Look for and make use of structure |
| Model with mathematics | Look for and express regularity in repeated reasoning |

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| * **Unit Academic Standards (NGSS, OLS and/or CCSS):** * **Minerals have specific quantifiable properties (SC.6.ESS.2)**  |  |  | | --- | --- | |  | **Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. MS-LS2-3.** | |

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies)  **Link for creating a soil test (soil profile)**  [**http://preparednessmama.com/jar-soil-test/**](http://preparednessmama.com/jar-soil-test/)  [**https://www.acs.org/content/dam/acsorg/education/resources/k-8/science-activities/planetearth/land/soil-sizes.pdf**](https://www.acs.org/content/dam/acsorg/education/resources/k-8/science-activities/planetearth/land/soil-sizes.pdf)   * **Cart Paper** * **Essential question chart** [**https://drive.google.com/file/d/11da7omApVLzDXL5AUixFfT1iePh0CD4d/view?usp=sharing**](https://drive.google.com/file/d/11da7omApVLzDXL5AUixFfT1iePh0CD4d/view?usp=sharing) * **What’s in My Soil Activity** [**https://drive.google.com/file/d/0B-WGqSIjBsnUc0ZKZThtSklhUDQ/view?usp=sharing**](https://drive.google.com/file/d/0B-WGqSIjBsnUc0ZKZThtSklhUDQ/view?usp=sharing) * **Frayer Chart** [**https://drive.google.com/open?id=0B-WGqSIjBsnUUEkxRFRTUjhyMFE**](https://drive.google.com/open?id=0B-WGqSIjBsnUUEkxRFRTUjhyMFE) * **Alum** |

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| **Teacher Advance Preparation:**   * **Collect soil from an area near the school or within the region you live in. Students can take a fieldtrip to a place nearby the school where digging up soil is allowed. In case of inclement weather, pre dug soil will work.** * **Jack and Jill clip is up and ready to be shown to the class.** * **Big idea and essential questions web; distribute to each table.** * **Essential Question chart** * **Gloves for extracting and observing soil samples.** |

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| **Activity Procedures:**  **DAY 1: Introduction to big idea/essential questions, and unit unpack**   * **Group students into teams of 3.** * **Show students a Jack and Jill clip, have the students discuss what Jack and Jill are doing.** * **Ask the question “Why are Jack and Jill getting water from the ground?” “Couldn’t there be some other places you could get water?”** * **Students are to discuss these questions with their teams only.** * **After teams have discussed their thoughts the discussion moves to whole class.** * **Distribute the big idea and essential questions/objectives web (unit unpack). Use web to generate essential questions.** * **Explain to students that under our feet there are vast water systems. Introduce the big idea.** * **Have students create a list of questions in their teams that they have about water under the ground.** * **When teams are finished have each share their questions to the whole class.** * **Write the questions down under the Essential Questions chart.** * **Have students copy big idea in their web.** * **Generate 2-3 essential questions from process of elimination, have students copy the questions into their web.** * **Unpack unit objectives and vocabulary into web (ESL)**   **DAY 2: Introduction to soil profiles**   * **Group students into teams of 3.** * **Recap discussion and essential questions from the previous day.** * **Ask each team “How could all of that water get into the ground?” What must that water pass through first to get there?”** * **Have students discuss with groups and whole class.** * **Introduce soil profiles and horizons (ESL frayer chart).** * **Have students extract soil from outside, make sure the students are digging at least 8 inches (or use the soil already extracted).** * **Have each student individually identify and write what they see inside of the soil samples.** * **Students will discuss what they see inside the soil.** * **Prompt students to mix their soil samples in their buckets by chopping the samples into fine grains. Have the students keep some roots, leaves, and grass (omit heavy amounts).** * **Have students fill their mason jars half way with their soil samples (have an example ready for students to see.)** * **Fill the jar with water and have the students shake the jar for about 1 min. (placing alum in the jar will help the sediments settle faster)** * **Place the jars in a place where sediments will have time to settle.** * **Let jars sit and use for the next lesson activity.** |
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**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

* Unit Web (to assess students pre knowledge for vocabulary)
  + Includes KWL chart and vocabulary check for objectives related to upcoming units.
* Frayer Chart

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details.   * Unit web gives students the opportunity to explore and expand major objectives, essential questions, and vocabulary that they will be expected to learn during the unit. * Frayer charts are designed for ESL students and language comprehension. Frayer charts give ESL students and students overall a chance to interact with necessary vocabulary to gain a deeper understanding of the content throughout the unit. * Small to large group discussion gives students a chance to gather and communicate their thoughts before contributing to a whole class discussion. |

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.  Tips   * Pre dug soil was given to each student due to the weather being too cold for students to dig into the ground. * Be sure to go through all soil to search for broken glass before allowing the students to explore the soil samples. * Make sure that the students are always wearing gloves for the “Day 2” activity. * Include some alum in the mason jars after students have placed their soil inside. The alum will help settle the particles into fine layers.   Reflection   * Students had a great discussion using the soil to infer on soils composition. * It would have been more efficient to have students make inferences on their own before making their inferences with a larger group/class. * It could have been helpful to include some things the students would not have expected to find in the soil. * It also would have been more efficient for later discussion if the students try to infer what they thought the composition of soil is by using the soil samples and a pie chart. This would have allowed the students a chance to refer back to their inferences during future lessons to modify later inquiry. * Soil layers can quickly develop after shaken in the jar (about 30 min) it could have been helpful to have discussion on what might happen to the layers as the jar was sitting still. * Overall, the students were very engaged in the lesson and discussion, they had a lot of fun trying to find bugs inside of their soil samples and even brought up discussion about germs, bacteria “and other tiny things” in the soil. |