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| **Lesson Title : Properties of Sand, Silt, Clay and Loam. Soil Triangles, and Water Infiltration/Absorption.** | **Unit #:****1** | **Lesson #:****2** | **Activity #:****4** |
| **Activity Title: Effectiveness of Infiltration and Absorption Using Soil Samples.**  |

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| **Estimated Lesson Duration:** | **8 days**  |
| **Estimated Activity Duration:** | **2 days**  |

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| **Setting:** | **Science Classroom**  |

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| **Activity Objectives:*** **Identify and describe the properties of sand, silt, clay, and loam.**
* **Describe how to use a soil triangle.**
* **Explain how to identify and classify a soil sample given a soil triangle tool.**
* **Design a test to measure the infiltration and absorption of water in sand, silt, and clay.**
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| **Activity Guiding Questions:*** **What is infiltration?**
* **What is leaching?**
* **Will sand, silt, or clay be the best for drainage?**
* **What are some practical agricultural uses for each sand, silt, and clay?**
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| **Next Generation Science Standards (NGSS)**  |
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| **Science and Engineering Practices (Check all that apply)**  | **Crosscutting Concepts (Check all that apply)** |
| [x]  Asking questions (for science) and defining problems (for engineering) | [x]  Patterns |
| [x]  Developing and using models | [x]  Cause and effect |
| [x]  Planning and carrying out investigations | [x]  Scale, proportion, and quantity |
| [x]  Analyzing and interpreting data | [x]  Systems and system models |
| [x]  Using mathematics and computational thinking | [x]  Energy and matter: Flows, cycles, and conservation |
| [x]  Constructing explanations (for science) and designing solutions (for engineering) | [x]  Structure and function.  |
| [x]  Engaging in argument from evidence | [x]  Stability and change.  |
| [x]  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)** |
| [x]  Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| [x]  Demonstrating Science Knowledge **(D)** |
| [x]  Interpreting and Communicating Science Concepts **(C)** |
| [x]  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)** |
| [x]  Make sense of problems and persevere in solving them | [x]  Useappropriate tools strategically |
| [x]  Reason abstractly and quantitatively | [x]  Attendto precision |
| [x]  Construct viable arguments and critique the reasoning of others | [x]  Look for and make use of structure |
| [x]  Model with mathematics | [x]  Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, OLS and/or CCSS):*** **Rocks, minerals, and soil have common and practical uses (SC.6.ESS.5)**
* **Minerals have specific quantifiable properties (SC.6.ESS.2)**
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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies)**SAND SILT CLAY WATER INFILTRATION VIDEO** [**https://youtu.be/cC7SPH2KEY4**](https://youtu.be/cC7SPH2KEY4)**SAND SILT CLAY LAB** [**http://www.all-science-fair-projects.com/project1332\_50\_2.html**](http://www.all-science-fair-projects.com/project1332_50_2.html) |

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| **Teacher Advance Preparation:*** **Prepare sand, silt, and clay samples.**
* **Prepare beakers of water**
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| **Activity Procedures:****DAY 11 - 12*** **Warm-up: “What do you think it means to infiltrate something? What does it mean to absorb something?”**
* **Have students discuss the warm up question in small groups first, then whole class.**
* **Direct students to the front of the class.**
* **Take a dry sponge and place some water onto the sponge. Only place enough water to make the sponge damp (not dripping).**
* **Connect this idea with absorption.**
* **Apply some more water to another dry sponge. Turn the sponge vertical so that the students can watch the sponge change color as the water infiltrates through it.**
* **Connect the term infiltration to the experience the students see.**
* **Invite the students to discuss which particle (sand, silt, or clay) they believe will absorb the most water.**
* **Invite the students to discuss which particle (sand, silt, or clay) they believe will allow for the most infiltration and drainage.**
* **Have students explain their thoughts whole class.**
* **Group students into teams of 2-3.**
* **Hand each team a lab procedures handout. http://www.all-science-fair-projects.com/project1332\_50\_2.html**
* **Have teams retrieve lab materials**
* **Carefully go over the procedures whole class.**
* **Hand students the “Water Infiltration and Absorption Handout”**
* **Prompt the students to come up with a hypothesis.**
* **Students will complete the lab and fill out their data on the handout.**
* **After all data is collected, students will write their conclusions (C.E.R) and answer question.**
* **Show the video**

[**https://youtu.be/cC7SPH2KEY4**](https://youtu.be/cC7SPH2KEY4)* **Have students infer on which soil types would be the best for agriculture. Remind students of what they have gathered over the unit.**
* [**http://extension.psu.edu/business/start-farming/soils-and-soil-management/soil-quality**](http://extension.psu.edu/business/start-farming/soils-and-soil-management/soil-quality)
* **Pass out “problem” cards to each team.**
* **“problem” cards present some type of particular problem with soil or the soils environment. Students are to create a solution to improve the soils quality.**
* **After each group completes the “problem” cards have students explain their solutions whole group.**
* **Exit ticket**
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**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

* **Exit ticket**
* **Lab data/conclusion**
* **“problem” cards**
* **Handouts**

**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.* 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.* This lab is a great connection to water absorption and soil for agriculture.
* Students were introduced to the topic of soil infiltration and absorption throughout previous activities, however they were not able to formally test these concepts for themselves.
* Having the students observe how the water infiltrates into the sponge for themselves as they recorded their observations might have been better for engagement.
* It would have been better to go over the “big question” with the students prior to the beginning of the lesson. Some students had trouble connecting the experiment to how each regions soil type could be good for agriculture.
* Students needed more time to develop solutions to the “soil problem” cards. Students were able to identify what the problems were, but did not have the proper time to communicate and share their solutions.
* Students needed more time to communicate and organize their solutions whole group. This would have been better for a review/assessment and a summary of the last two days.
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