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| **Lesson Title: Properties of Sand, Silt, Clay and Loam. Soil Triangles, and Water Infiltration/Absorption.**  | **Unit #:****1** | **Lesson #:****2** | **Activity #:****3** |
| **Activity Title: Introduction to a Soil Triangle and the Properties of Sand, Silt, Clay, and Loam. (particle size exploration & sample identification)** |

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| **Estimated Lesson Duration:** | **9 days**  |
| **Estimated Activity Duration:** | **3 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.**
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| **Activity Guiding Questions:*** **Does sand, silt, or clay have the largest particle size?**
* **Does sand, silt or clay have the smallest particle size?**
* **How does particle size effect water infiltration and absorption?**
* **How can scientist use a soil triangle to classify soil samples?**
* **What is infiltration?**
* **Will sand, silt, or clay be the best for drainage?**
* **What are some practical agricultural uses for each sand, silt, and clay?**
* **What are the special characteristics of loam?**
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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)How to read a soil triangle activity Soil texture lab **ONLINE RESOURCE ACTIVITY** [**https://school.discoveryeducation.com/schooladventures/soil/name\_soil.html**](https://school.discoveryeducation.com/schooladventures/soil/name_soil.html)**LAB MATERIALS** * **Sand, silt, and clay particles**
* **Graduated cylinder**
* **Ziploc bags**
* **Ruler**
* **Water**
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| **Teacher Advance Preparation:** * **Prepare samples of silt and clay (you can do this by filtering out small particles from a soil sample)**
* **Purchase play sand and dry clay**
* **Prepare class set of soil triangles**
* **Prepare soil samples for investigation**
* **Prepare soil sample mixes of clay loam, sandy loam, clay, silt, sand, loamy clay and any other soil combinations.**
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| **Activity Procedures:** **DAY 8*** **Warm up: Think about the words sand, silt, and clay. What comes to mind when you hear these words? How are these words different? How are they similar?**
* **After the warm up students are asked to discuss their answers whole class.**
* **Distribute small samples of sand, silt, and clay.**
* **Invite the students to discuss amongst their table groups. Which do you think is sand? Which do you think is silt? Which do you think is clay?**
* **Have students discuss whole class.**
* **Have students retrieve their unit frayer charts.**
* **Students will write the definitions of sand, silt, and clay in their frayer charts.**
* **Have students open their laptops and login to discovery education (**[**https://school.discoveryeducation.com/schooladventures/soil/name\_soil.html**](https://school.discoveryeducation.com/schooladventures/soil/name_soil.html)**)**
* **Distribute the “Soil Under a Microscope” handout.**
* **Have students get into pairs.**
* **Distribute rulers to each pair of students. Remind students of the inches and centimeters side of the ruler. Tell students they will be using the centimeter side.**
* **Have students access the graphic shown on the online activity.**
* **Tell students they are to draw and label each particle by size in their handouts.**
* **Have students discuss the sizes.**
* **Show students a power point that compares the sizes of each particle to other things.**
* **Exit ticket**

**DAY 9*** **Have students access the online activity from the previous day.** [**https://school.discoveryeducation.com/schooladventures/soil/name\_soil.html**](https://school.discoveryeducation.com/schooladventures/soil/name_soil.html)
* **Have students discuss the concepts covered from the previous day whole class.**
* **Have students retrieve their “Soil Under a Microscope” handout**
* **Students are to read the assigned section of sand, silt, clay, and loam.**
* **When students are finished reading and answering the characteristic questions in their handouts have students rotate tables and share the rest of the information.**
* **Students should be discussing their findings on the characteristics of each sand, silt, clay, and loam.**
* **When finished with the activity, students should have a completed handout.**
* **Show the video below** [**https://youtu.be/dsfJRwZXaVk**](https://youtu.be/dsfJRwZXaVk)

**DAY 10** * **Warm-Up: Describe some properties of sand, silt, clay, or loam that you have learned from the previous lessons.**
* **Have students discuss their warm up answers in small groups.**
* **Invite students to share some of their answers whole class.**
* **Distribute soil triangles to each student.**
* [**https://www.nbcsd.org/cms/lib/PA01001217/Centricity/Domain/116/Soil%20Texture%20Soil%20Activity.pdf**](https://www.nbcsd.org/cms/lib/PA01001217/Centricity/Domain/116/Soil%20Texture%20Soil%20Activity.pdf)
* **Complete a practice problem with the students. Model how to use the soil triangle.**
* **Have students complete the handout in pairs using their soil triangles.**
* **When students are finished with their handouts, distribute soil samples.**
* **Have students test each sample using the lab procedures on** [**http://www.soils4kids.org/experiments**](http://www.soils4kids.org/experiments)
* **Students use their soil triangles to classify each soil sample.**
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**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

* **Exit ticket**
* **Soil triangle handout**
* **Soil under a microscope handout**

**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.

<https://schoology.cps-k12.org/assignment/1385509289>

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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.* A task card activity would have been nice to use as a summative assessment on using soil triangles.
* When collecting clay, be sure to grind the clay down as fine as possible and store in a bucket that is dry. Moisture will create hard chunks of clay (which are great for showing students but hard to manage during the lab).
* An adapted version of the soil lab can be found here. (easier for ESL students)
* <https://www.smusd.org/cms/lib/CA01000805/.../1836/Soil%20Texture%20Lab.doc>
* “Day 8 activity went well. However, it would have been better for student understanding if each particle size was compared to the size of something the student could identify. It was hard for some students to conceive the sizes of the particles in mm. Students had a fair understanding of particle sizes compared to each sand, silt, and clay, but struggled to understand size in mm.
* Group discussion went well on “Day 9” with soil properties. There was a lot of room for discussion, but no supplemental materials for documenting and reviewing the discussions. Students had a hard time referencing their discussion and bringing the discussion points up in later dates/lessons. A graphic organizer would have helped. Each student could have shared information, any missing information could have been documented. Class could have shared whole group with a model on the board for a review of concepts.
* On “Day 10” time was a hard constraint. The soil triangle lesson would have been better taught as its own daily lesson and activity. It was difficult to finish the engagement activity and felt a little rushed at the end of the day. Students needed an entire class period to practice using the soil triangle. There was no time for a review/assessment on this day because of cleanup time. It would have been better to stretch this day into two class periods.
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