



Classifying Soil

2025 NSF NHERI Large Mobile Shakers at the University of Texas at Austin
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- **Summary-**

Students will learn how to classify soil and the importance of soil classification.

- **Engineering Connection-**

Geotechnical engineering and earthquake engineering relies on a universal soil classification system, any construction that takes place in earthquake prone areas will need to understand how the soil will react in the case of an earthquake. The behavior of soil can be predicted by its classification (e.g., Sand silt or clay.)

- **Audience-**

3-5th grade

- **Lesson Objectives-**

- Student will learn the different types of soil
- Students will know how to differentiate between different soil types
- Student will understand how soil class impacts soil behavior (stiffness, damping ability, etc.)
- Student will be able to use soil class to “decide” whether a site is safe for construction/habitation

- **Educational Standards-**

- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]
- Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

- **Material List-**

- Different soil samples (pre-identified)
- List of soil characteristics
- Pictures/videos

- **Introduction-**

It's important for students and potential future engineers to get hands-on experience with soil. Different soils behave differently under seismic loads (think liquefaction) and knowing how different soils look and feel is a great way to get kids to think more about the earth under their feet.

- **Procedure-**

- **Background knowledge**

- Explain liquefaction, or the phenomenon of soil behaving like a liquid under a seismic load. Certain soils, if you shake them just right, will rearrange their particles and behave like a liquid,
- Show examples, like Niigata 1964 (earthquake-caused liquefaction resulted in buildings sinking), Christchurch 2011.

- **Before the activity**

- Give kids a list of physical and tactile features associated with each kind of soil (sand, silt, clay), show videos of liquefaction occurring, and soil samples being shaken.

- **During the activity**

- Give students samples, and have them 1) make a guess of the soil class based on the characteristics described in the list, and 2) rank the soils based on which one they think would make the best foundation/which one they think is the "strongest"

- **After the activity**

- Show students photographs of different landscapes with different soils. Ask them to explain why each would be good or bad for construction based on what they experienced/felt/observed in the experiment.

- **Assessment-**

Correctly ranking and identifying the soil samples shows a mastery of the subject.

- **Wrap-up-**

Ask students to feel and identify the type of soil near their homes, tell them to think about what kind of soil they are standing on.