

Soil Properties 2022 UC Davis Lesson Plan

Summary

Students will learn about soil properties and standard soil testing practices in geotechnical engineering for a two-day camp. They will make pretest predictions of soil properties and conduct tests to confirm their predictions.

Engineering Connection

Making sure the type of soil under structures is stable for construction for the safety of the community and people inside or around the structure. A structure is nothing with a weak foundation.

Audience

6-8 grade (middle school)

Scientific Concepts

Soil properties

Standard soil testing practices

Lesson Objectives

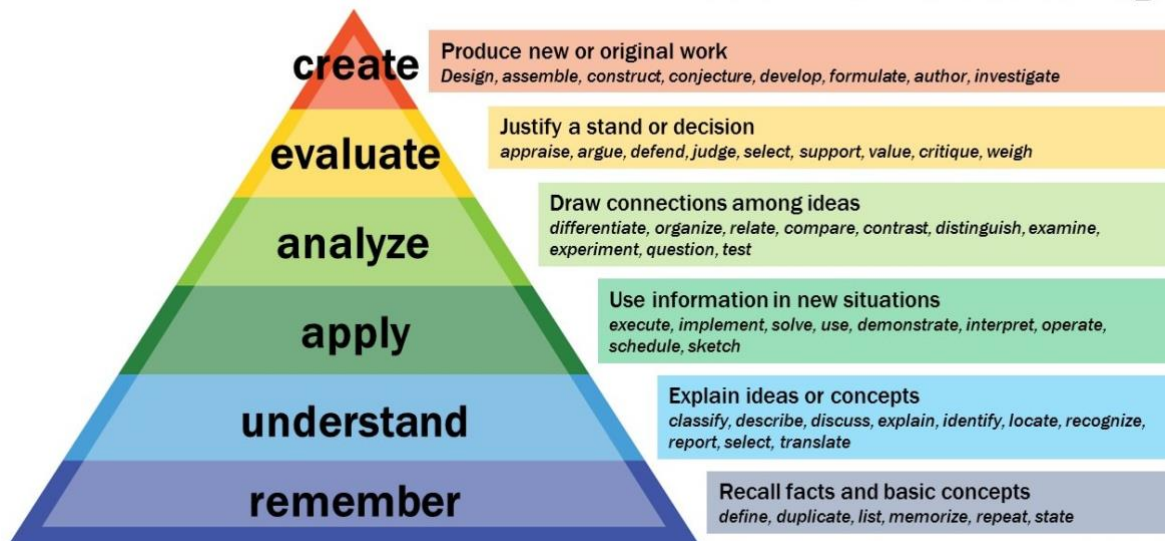
Define soil properties

Classify and describe soils

Demonstrate different properties through feel and construction

Test standard soil practices (Sieve analysis and Atterberg limits)

Bloom's Taxonomy



Educational Standards

Common Core Lesson Plan for Middle School

Material List

Sand, Silty Sand, and Clay

Different Sieves

Grooving tools

Droppers

Water

Moisture Plates

ASTM Chart

Plasticity Index Plot

Spatulas

Introduction

Studying different soil properties is important to help a home stand and critical to the environment and safety of people. Understanding soil properties is vital to different industries – construction, agriculture, engineering, and many more.

Procedure

Background knowledge

- Definitions: plasticity, gravel, sand, clay, silt, water content, absorption, voids, texture, density, Liquid Limit, Plastic Limit, sieves, sieve analysis, and Atterberg limits.
- How to classify soil with ASTM and Plasticity Plot

Before the activity

- Mini lesson on sand, silt, and clay differences
- Vocabulary related to soil classification
- Prepare several samples of sand, silt, and clay for students in advance of lesson/camp

During the activity

1. Feel different soil types and make predictions on which is sand, silt, or clay after mini lesson
2. While showing students different sieves sizes and allowing volunteers to pour soil at the top of sieves, perform dry sieve analysis tests.
3. Show uniform soil in sieves and allow students to feel
4. Weigh pans and graph for grain size distribution
5. Give students prepared soil for liquid limit and plastic limit test (Atterberg Limits)
6. Allow them to feel the different soils to tell the differences
7. Continue rolling soil on moisture plate until it breaks for plastic limit, weigh, and place in oven for 24 hours

8. Wet soil for liquid limit test and perform liquid limit test. Drop till the soil closes a small groove and count the number of drops
9. Collect the soil that closed, weigh, and place in oven for 24 hours
10. After 24 hours, weigh samples and collect data.

After the activity

- Evaluate data and check student predictions
- Classify official soil type

Assessment

No need for test. Predictions and soil testing is good to master objectives.

Wrap-up

- Review soil properties and give more real world-examples where this is used
- Get student input and examples of why soil is important for engineering
- Give students their own hardened and dry clay sample, marked with camp name and date, to take home