

Teaching Soil Texture in an Online Intro Soils Course

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Abstract

Introductory Soil Science laboratories are inherently a hands-on process. Concepts such as soil color, bulk density, porosity, and horizonation are often learned best with examples and tactile experiences. Online learners in Intro Soils can have a variety of obstacles to overcome to effectively learn these concepts. Designing practical and affordable laboratory lessons that get the students experiencing soils and comprehending the topic matter requires well designed labs and lab kits. This paper demonstrates one hands-on laboratory lesson designed for online learners that engages the student, provides tactile experience, and is affordable to boot.

Course: Introductory Soil Science and Soil Laboratory (SOIL205)

Educational Objectives:

- Learn and carry out practical laboratory experiments to determine specific soil properties
- Become proficient in basic soils tasks, such as hand texturing and pH measurement, and calculations of soil properties
- Explore and utilize web-based soil survey information and to use this information to make land-use interpretations for a given area
- Apply concepts learned via the laboratory and lecture materials to making land-use interpretations for given soil conditions

Target Audience:

Course meets the requirements for a biological or physical science laboratory course. There are no pre-reqs, so students coe to this course from multiple majors, but frequently are in the natural resource sciences

Difficulties faced by Online Learners in a Soil Science Class

- Access to lab kit – expense of lab kit
- Access to field sites – many online learners are city dwellers
- Lack of preparatory coursework for an interdisciplinary course– students are often deficient in physical, biological, and chemistry coursework
- Fear of getting dirty

Sample Lab: Soil Texture

Lab Objective:

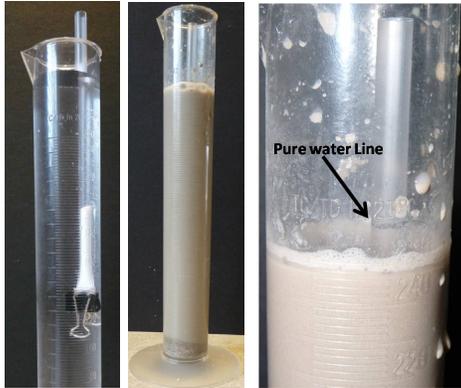
Differentiate between the various fine earth fraction texture classes; determine soil limitations based on soil texture; learn the various soil structure types.

- *Goal 1: define the size classes of sand, silt, and clay; explain the unique properties of each particle type*
- *Goal 2: Use textural triangle to determine texture class and percentages of one type of soil particle given the others.*
- *Goal 3: Utilize a mechanical settling method to approximate soil particle size distribution; use hand texturing methods to determine appropriate soil particle size distribution.*

Materials: (*indicates included in ordered lab kit)

Camera	*Graduated cylinder
Permanent marker	*2 soil samples from Kit
*Scale	Week 1 Soil samples
Dixie cup (or light container)	Drinking straw
Tape or paper clip	
Water	

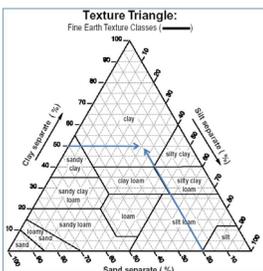
Lab Exercises



Hydrometer Creation: Students read about Stokes Law (particle settling) and how suspension density changes as particles settle out. The concept of a hydrometer is introduced and then students create a homemade hydrometer using a straw, some salt, and a paper clip.

Hydrometer is calibrated to pure water and then floated in the suspension students create, demonstrating density changes as particles settle; settling rate is dependent on particle size. Particle separation due to settling rates is observed in the cylinder. Students then use this information to postulate how sediments behave in natural systems like rivers and lakes.

This experiment is performed on known texture samples provided in the lab kit and on samples students collected.



From the United States Department of Agriculture

Hand Texturing: A key field skill, students learn the “feel” of soils. First the students hand texture the known samples from the lab kit to calibrate their hand. Video aids are used to demonstrate hand texturing of a sample. Students then hand texture their own samples.

Reading material discusses the textural triangle, the properties of sand, silt and clay, and how texture influences movement/storage of water in natural systems, engineering, plant growth, and erosion potential.



From Bill Cook, Michigan State

Assessment of understanding and skills:

The lab kit contains unknown texture samples. Students attempt to determine the texture as best as possible. They are graded based on their ability to determine the loam/clay loam/clay status of the sample. Students must also estimate clay and sand percentages to determine texture class.

Values of two percentages (e.g. clay and silt or sand and clay) are provided and students calculate the third and determine texture class.

Questions posing situations where soils texture might be useful (such as water storage capacity) and students must answer how texture affects the situation

Full suite of Labs:

- Landscapes
- Sampling Soils
- Chem
- Soil forming materials
- Color
- Texture
- Bulk Density
- Moisture
- pH
- Genesis
- Soil Survey
- Horizons
- Bioassay