Getting Dirty

Turning 6th Graders into Soil Scientists
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RET II

RET I Project

- Worked with Joanna Deek in Cyrus Safinya's Lab.
- Worked on Purifying neurofilament proteins from cow spinal cords, then manipulated the spaces between the networks using different buffer solutions.

Reasons for Change

- Taught all three Jr. High Classes
- Emphasis has been on Physical Science
- Earth Science labs and curriculum at school are sorely lacking.
- Will have 5 periods of Earth Science next year (including an honors class).

Students Group

- 4 periods of "standard" 6th grade Earth Science
- 70% of school in some stage of EL
- 100% Free Lunch School
- High Migrant Population
- Recently received $675k grant from the DoD for technology in Science classrooms.

The Project

- 6 mini labs- "Skills Toolbox"
- Many labs contain a "home science" and a "lab science" component.
- Large CSI style investigation.

Small lessons once a week, with the CSI investigation being a full week.

California Science Standards

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:
   e. Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:
   b. Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
   a. Develop a hypothesis.
   b. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
   d. Communicate the steps and results from an investigation in written reports and oral presentations.
   e. Recognize whether evidence is consistent with a proposed explanation.

Student Objectives

At the end of this unit the students will be able to:

- Describe the uses and accuracy of a variety of soil tests.
- Combine data from soil tests to analyze soil composition.
- Compare and Contrast an unknown soil sample to previously studied samples.

Innovations

- Embedded academic oral language practice
- Cornell Notes formatting
- Builds a skills toolbox
- CSI style investigation

Lab Task	Directions	Data
	Topic: Soil Composition **Part 1: Soil Texture**	**Soil Scientist:** **Group Name:** **Period:** **Date:**
Purpose	You can identify soils based on the amount of clay, silt and sand that make them up.	
Question	Is the soil hand test an accurate way of identifying soil texture?	
Hypothesis	Complete the following sentence frame to construct your hypothesis.	I predict that _____ because_____.
Materials		Location
	1. 3 Soil Samples 2. Water 3. Test Tubes 4. Hand Test Chart 5. Soil Texture Pyramid 6. Metric Ruler 7. Dropper 8. Test Tube Stopper 9. Masking Tape	1._____ 2._____ 3._____ 4._____ 5._____ 6._____ 7._____ 8._____ 9._____
Procedures **Part 1:** **Hand Test**	1. Place approximately a teaspoon of soil into your palm. 2. Add drops of water slowly	Rationale 1._____

Results Part 2: Settling Test	7. When all samples are fully settled, measure the height of the layers using a metric ruler and record below. Complete the table. To find percentages, divide the height of the layer by the total height of soil. Use the soil pyramid chart to identify your type of soil.	7._____ <table><tr><td>Sample #</td><td>Total height</td><td>height of sand</td><td>% sand</td><td>height of silt</td><td>% silt</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <table><tr><td>Sample #</td><td>Height of clay</td><td>% clay</td><td>Type of Soil</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Conclusion	Complete the sentence frame about your original hypothesis.	My hypothesis was _____ because _____.

Summary: (On a separate piece of paper) 1) Why is it necessary to identify the type of soil texture? 2) Which of the tests do you think is the most useful and why? 3) How could you use this information in identifying an unknown sample? 4) Include a labeled drawing of at least one of your tests.
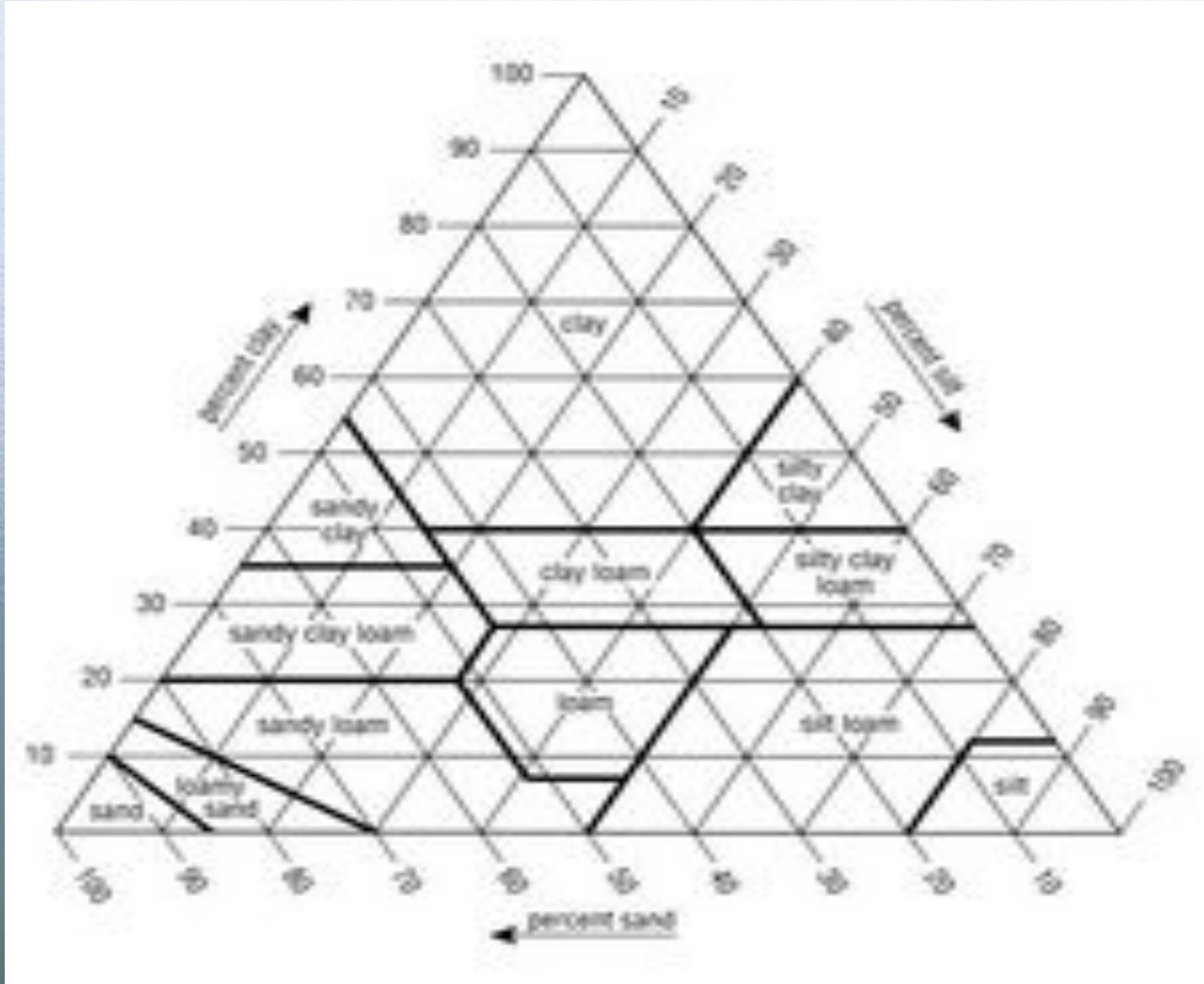
Part 1: Soil Texture

Home
Soil Hand Test

Lab
Soil Settling Test

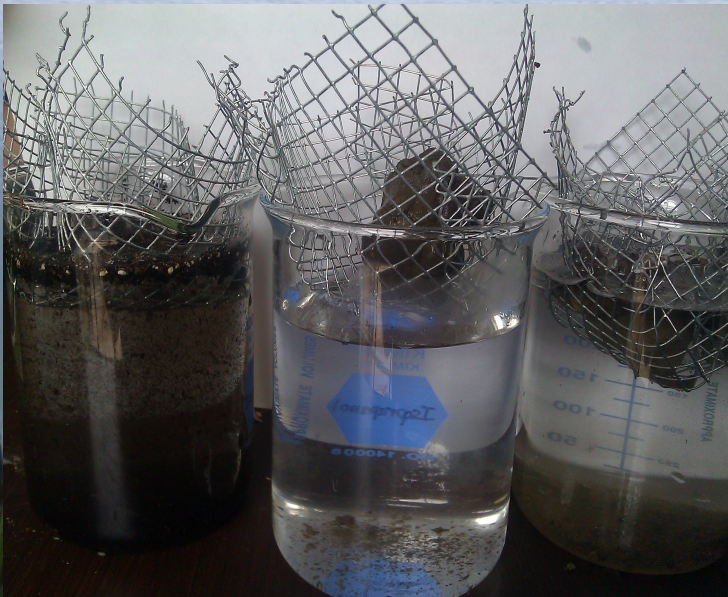# Part 2: Soil Air Content

Home
Bubble Test

Lab
Settling Test

Part 3: Soil Moisture

Home/Lab
Soil Drying

Part 4: Organic Materials

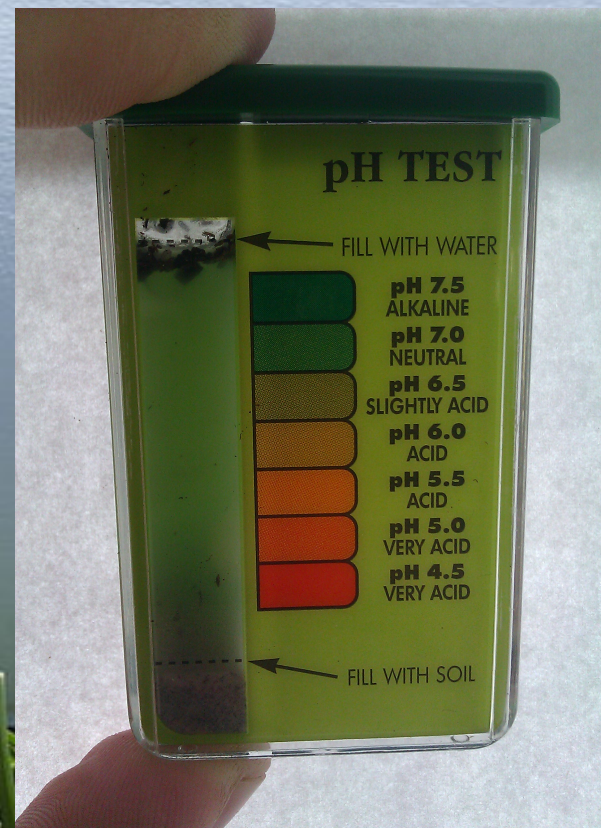**Home**
Water Test

Lab
Hydrogen Peroxide Test

Part 5: Soil pH

Home
Baking Soda/Vinegar Test

Lab
pH Capsule

Part 6: Soil Nutrients

Home/Lab
Capsule Tests

Special Assignment

- Identify an unknown sample by matching it to your previous results.
- Design your experiments/tests
- Time is an issue.

Assessment Products

- Completed Lab Reports
- Portfolio Project
- Tests will remain very similar to last year, and can be used for comparison.

Materials	Complete and accurate list of the locations of the materials used. Easily used by others to find materials.	Complete and accurate list of the locations of the materials used. May be confusing for others to use.	Locations list is complete, but partially inaccurate.	Locations list in incomplete.	Section Left Blank.
Procedures	Rationales for each step of the procedures is complete and correctly describes why the steps in the procedure should be followed.	Rationales for each step of the procedures is complete, although some of the reasons given may be incorrect.	Rationales for each step of the procedures is complete, although most of the reasons given are incorrect.	Rationales for each step are not complete.	Section Left Blank.
Results	Data table is correctly and fully completed. All measurements include the units used to make the measurements.	Data table is correctly and fully completed. Measurements are missing units.	Data table is complete with some errors.	Data table is incomplete.	Section Left Blank.
Conclusion	Correctly identifies the result of the hypothesis, and correctly identifies why the result occurred.	Correctly identifies the result of the hypothesis but struggles to explain why the result occurred.	Correctly identifies the result of the hypothesis but does not explain the results.	Incorrectly identifies the result of the hypothesis.	Section Left Blank.
Summary: Spelling, Grammar and Punctuation	Summary uses correct spelling, grammar and punctuation throughout with less than 2 mistakes.	Summary uses correct spelling, grammar and punctuation throughout with less than 7 mistakes	Summary uses correct spelling, grammar and punctuation throughout with less than 12 mistakes	Numerous spelling, grammar and punctuation mistakes.	Summary is illegible or missing.
Summary: Questions	All questions posed in the summary are fully and	All questions posed in the summary are answered.	Most questions in the summary are answered.	Most questions in the summary are not answered.	Summary is illegible or

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