Introduction
Matt Hajdun
FLA 518 Content-Based Instruction
Unit Introduction

TITLE:
Soil Composition and Health

GRADE LEVEL:
Third

TARGET GROUP:
Sheltered bilingual English/Spanish classroom

UNIT LESSONS:
Soil Trek, Soil Soakers and Soil on the Run from, Project Seasons, by Deborah Parrella. The Project Seasons curriculum was published by Shelburne Farms Press, in Shelburne, VT.

WRITTEN READINGS:
Readings are not an included part of the developed unit because there is no textbook to accompany the unit. Reading related to the unit’s lesson plans have been created, modified from Project Seasons, and taken from, A True Book: Soil, by Christin Ditchfield. A True Book: Soil, was published by Children’s Press in Danbury, CT.

LEARNING GOALS:
1) I want my students to know how to perform simple soil investigations, experiments and simulations.
2) I want my students to know how to describe the contents of soil and how to classify different soil types.
3) I want my students to know about soil erosion and how they can care prevent it.
Lesson 1
**Language Objectives:**
Students will be able to:
- Listen and follow a set of oral directions
- In groups to the whole class, present the steps of the field study and their findings in an oral summary
- Write a letter summarizing results from a field study

<table>
<thead>
<tr>
<th>Domain</th>
<th>Topic</th>
<th>Starting</th>
<th>Emerging</th>
<th>Developing</th>
<th>Expanding</th>
<th>Bridging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening</td>
<td>Steps outlining the process of a field study</td>
<td>Circle pictures of words that were presented in the oral description of tasks. Cross out words not included.</td>
<td>Order three pictures in the order outlined in the oral instructions.</td>
<td>Sequence five pictures that include a written description in the order enumerated in the oral instructions.</td>
<td>Orally summarize to a partner the steps presented in the oral instruction with the use of a listening guide.</td>
<td>Orally summarize to a partner the steps presented in the oral instruction.</td>
</tr>
<tr>
<td>Speaking</td>
<td>Soil field study using the five senses</td>
<td>In their small group, give the name for the different tools used during the experiment and their purpose (shovel, to dig).</td>
<td>In their small group, enumerate the steps used for performing the various tests.</td>
<td>Working with members from their group, report to the whole class the information collected from a scaffolded summary sheet.</td>
<td>Working with members from their group, describe to the whole class three of the experiments performed and state the results of those experiments using a sentence starter guide.</td>
<td>Working with members from their group present to the whole class a summary in complete sentences, all of the steps and findings in the experiment using notes as a guide.</td>
</tr>
<tr>
<td>Writing</td>
<td>Summary of a field study</td>
<td>Complete a letter with pre-written sentences and blanks using words from a word bank supported with pictures.</td>
<td>Complete a letter with pre-written sentences and blanks using words from a word bank.</td>
<td>In a letter, write one original sentence applied to four of the five sentences using sentence starters.</td>
<td>Generate a one-two paragraph letter with sentence starters available and following an example provided by the teacher.</td>
<td>Write a two-three paragraph letter about the results of the soil study including a description using the five senses following an example provided by the teacher.</td>
</tr>
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</table>
### Modified Unit: Functional Notional Chart
#### Lesson 1

<table>
<thead>
<tr>
<th>Function</th>
<th>Situation</th>
<th>Expression</th>
<th>Words</th>
<th>Grammar</th>
</tr>
</thead>
</table>
| Describe | How soil appeals to the senses | The soil → looks ______  
              → smells ______  
              → feels ______  
              → sounds ______ | Dark, brown, lumpy, different in places  
Wet, old, musty,  
Wet, cool, rough, hard/soft, different in places  
Silent, quiet | Adjectives |
| Summarize | How the experiment was completed | First, Next, Then, After that, Finally | | Transition words |
|          | We used the ____ to ____ the soil. | | | |
|          | | | Thermometer: take the temperature of  
Shovel: dig a sample of  
Magnifying glass: look close at  
Compaction stick: find the hardness of  
Can: measure how water drains through |
Lesson Plan One

*Lesson Plan format was taken from a SIOP template in Making Content Comprehensible for English Language Learners: The SIOP Model by Echevarria, Vogt and Short.*

**LESSON TOPIC:**
Observing soil

**OBJECTIVES:**

*Content objective:*
Students will be able to perform simple soil analysis tests to understand the properties of soil and relate these experiences to the five senses through the completion of a modified field study.

*Language objectives:*
Students will be able to:
- Listen and follow a set of oral directions
- In groups to the whole class, present the steps of the field study and their findings in an oral summary
- Write a letter summarizing results from a field study

**LEARNING STRATEGIES:**
Building background knowledge, graphic organizers, work in groups and pairs, modeling, student inquiry, listening guides, hands-on interaction, visual aids, demonstration

**KEY VOCABULARY:**
Soil, hard, soft, temperature, drain, observation, observe, thermometer, compaction stick, rough, wet, dry, investigate, looks, sounds, feels, smells

(Have vocabulary available on a word wall)

**MATERIALS:**
Student letters, tape recording, stereo, aluminum trays, Zip-lock bags, index cards, glue, ½ wooden dowels with one sharpened point, thermometers, aluminum coffee cans with both ends cut off, 20 oz water bottles, overhead projector, timers, chart paper, pencils, What We Know About Soil sheet, Soil Study sheet, Listening Guide

**MOTIVATION/BUILDING BACKGROUND:**
1) Around the room, have envelopes addressed to each student with a modified message inside (p. 1 for Advanced students, p. 2 for Intermediate and p. 3 for Beginner). Allow time for students to read each letter and then discuss what their letter says in small groups. Children will discuss questions like: Who sent the letter? Why was the letter sent? What does the letter ask for?
2) The teacher then reads the message he/she received to the class and asks students what new information they heard from the letter.
3) Distribute, “What WE Know About Soil” worksheets (p. 15 Advanced students, p. 16 Intermediate and Beginner) and have students circle words they think relate to the term soil. After a word is circled, students draw a line back to the word soil. If students know a word or two that describe the connection between that word and soil, they may write it on the line.

- Model this procedure on an overhead using a think aloud scaffolding technique.
- Have student share what they already know about soil with a partner after they have completed the worksheet.

**Presentation:**

1) Pass out listening guides (p. 5 for Advanced students, p. 6 for Intermediate and Beginner) to the students and play the tape provided (script on page 4) by the aliens two times outlining the soil observation.

- After listening to the tape, review the steps outlined in the tape.
  - According to modifications, some students will review the steps by either:
    1. crossing pictures of elements not included in the study (Beginner students – page 8)
    2. sequence pictures relating to the investigation using words like first, second and third (Intermediate students – page 7)
    3. provide an oral summary in pairs about the steps of the investigation (Advanced students)

2) Open the box and show each of the tools students will use to perform the observation. Put one of the four observation tools in each corner (1 – coffee can, ruler, timer 2 – wooden dowel sharpened on one point 3 – shovel, index card, magnifying glass, glue, aluminum tray, plastic bag 4 – thermometer) of the room and perform a modified “Four Corners” activity. Divide students into each corner and give students two minutes to share predictions about how and for what each tool will be used in the soil investigation.

3) After hearing predictions from the students in a whole group review, place sentence strips (back slot of binder) on the board that contain the names of each investigation tool. Also have sentence strips that include the function of each tool. Show each tool, and ask students to individually match a tool’s function to its name. For example: Thermometer – to take the temperature of the soil.

End Day One.

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Start Day Two.

1) Review goals and objectives, and what students know about soil already. Show each observation tool left by the aliens and complete sentence strip activity (Activity 3 above) of each tool and its use once again as a class.

2) Distribute Soil Study sheet (p. 9-10, only one copy per group) and model each of the four observation experiments students will perform. After demonstrating each step using the instruments ask a student to orally review
the process or for a student to perform the task a second time for the rest of the class to observe repeating the directions while the student performs the task.

**Practice/Application:**
1) Place students in groups of four and assign jobs to each student. Then go outside and perform the soil investigation with students:
   - Jobs include:
     a. Recorder – Completes group lab sheet
     b. Drainage tester – Completes soil percolation test
     c. Compacter – Completes the compaction test
     d. Doctor – Takes the soil’s temperature
     e. All students – Create and examine a soil sample and analyze it according to the five senses.
2) After completing the soil investigation, students will present their findings to the class and on the front board all data will be compiled after each presentation. Have one page of easel board paper for each experiment (temperature, compaction, drainage and observations).

**Review/Assessment:**
1) Using the data on the front board, the teacher will lead a class discussion over the following questions:
   - What did the soil feel like?
   - What did the soil smell like?
   - What did the soil look like?
   - What did the soil sound like?
   - What was in the soil? What was the soil made of?
   - In which soil did the water drain, or leave from the can, quickest?
   - In which soil did the water drain the slowest?
   - What was the temperature of the soil? Is that warmer or cooler than the air?
   - Where was the soil hardest, where did the soil compacter not go far into the soil?
   - Where was the soil softest, where did the soil compacter go deep into the soil?
2) Distribute a new graphic organizer (same as provided the day before – page 15 or 16) that was given out yesterday and have students individually complete the organizer with their new information. Have students compare their completed organizers in pairs.
3) As a class, with the teacher as a model, create a letter (sample included see page 11) to send to the Tridains. After discussing the components of a strong letter, individually, students will write a letter (letter form p. 13, sentence starters for Intermediate students on p. 12, Beginner student fill-in letter on p. 14) to send back to the Tridians sharing the information discovered in the soil investigations.
Modified Texts

Original text is included as an attachment and is taken from:
Text was taken from page 61 and modified to meet both language and content needs.

ADVANCED STUDENTS:

Greeting Earthling Students in Room 14,

We are from the planet Trid. We have been watching you very closely and have seen you reading, writing, studying and asking questions. We believe that you have all the scientific skills we have been looking for. Our planet is in a lot of danger, and we need your help. We are running out of all the things we need to live. We need your help in observing your planet's soil. We will send down to you some investigation tool to use and a tape describing the tests you must do. Please write us a letter back as a complete report about your soil and what makes it so special.

Thank you for your help. Our planet is in your dirty hands.

The Tridians
Intermediate Students:

Good morning person of Earth in Room 14,

We are from the planet Trid. We can see that you are good at science and we need your help. We are in trouble. We need you to test the soil on Earth. We will send some things down to help you test the soil. Please write us letter to tell us about your soil.

Thank you for your help.

The Tridians

Clave de traducir

Science = Ciencia
Send = Enviar
Test = Examinar

We are in trouble = Estamos en un aprieto
Hello student from room 14,

We are aliens,

We have been watching you and we need your help (**ayuda**).

We need you to test (**examinar**) your soil.

Please write us a letter about your tests.

Thank you,
Hello students of Earth!

We hope that you received our letters (Pause 2 seconds).

We have sent down a box with tools in it for you to use (Pause 2 seconds).

These are tools we use on our planet to observe our soil (Pause 2 seconds).

With these tools we need you to test your soil (Pause 2 seconds).

We need you to do the following things (Pause 2 seconds).

First we need you to take the temperature of your soil (Pause 4 seconds).

Then we need you to collect a sample of your soil (Pause 4 seconds).

Next we need you to push the compaction stick into the soil (Pause 4 seconds).

After that we need you to test how fast the water drains from your soil (Pause 4 seconds).

Finally, we need you to present your information to your class and to us (Pause 4 seconds).

Thank you for your help.

Our planet needs your hard work.
Listening Guide (Expanding Students)

With these tools we need you to __________ your soil.

We need you to do the following things.

First we need you to __________ the temperature of your soil.

Then we need you to __________ a sample of your soil.

Next we need you to __________ the compaction stick into the soil.

________________ we need you to test how fast the water _________

from your soil.

Finally, we need you __________ your information.
Listening Guide (Intermediate and Beginner Students)

Mark with a check (✓) when you hear the step described.

___ Take the temperature of the soil.

___ Collect a soil sample.

___ Push the compaction stick into the soil.

___ Test how fast the water drains.

___ Present your information.
Put the pictures in order by writing:
First, Second, Third, Fourth and Fifth.

Push the compaction stick in the soil.

Present your information.

Collect a sample.

Test how fast the water drains.

Take the temperature.
Listening Activity for Beginner Students

Put an 'x' through the pictures that do not belong.
Poner un 'x' por los dibujos que no deben estar.
Modified Lab Sheet

Original lab sheet is included as an attachment and is taken from:
Text was taken from pages 65-66 and modified to meet both language and content needs.

SOIL STUDY

Names of Scientists: ________________________________

Date of observation: _______________  Time of observation: _______________

1. Stick the thermometer in the ground.
   Wait ten minutes. Then check the temperature of the soil.
   The temperature is ______ degress.

2. Dig up a sample of the soil.
   Place some soil in the plastic bag.
   Place some soil on the tray.
   Glue some soil to the index card.
   Look at the soil with the magnifying glass.
   Touch, smell and listen to the soil.
<table>
<thead>
<tr>
<th>The soil smells</th>
<th>The soil feels</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>The soil looks</td>
<td>The soil sounds</td>
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<tr>
<td>------------------------------</td>
<td>------------------------------</td>
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<td></td>
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</tbody>
</table>

3. Push the compaction stick into the soil.

Remember you must push, not wiggle the stick.

How many inches did the stick go into the soil? _______ inches.

4. Push the can one inch into the ground.

Pour water into the can in the ground until it is full.

Start the timer when the can is full.

Stop the timer when all the water is gone.

It took _______ seconds for the water to drain.
Sample Letter by the Teacher
(To be placed on chart paper and modeled to the class)

Hello alien friends,

We have finished our soil study. It was a real blast! We had fun working in groups and learning about the soil. Here is what we found out about soil on Earth.

First we used the thermometer to take the temperature of the soil. It was only 50 degrees. Next we used the magnifying glass and saw that soil has rocks, leaves and bugs in it! Then we used the can and ruler to see how water drained through the soil. It drained in twenty seconds! Finally, we used the compaction stick to test how hard the soil was. It was soft.

On Earth soil feels lumpy and cool. It looks brown and is made of very small pieces. Soil does not make any sounds and smells old and wet.

I hope you can use what I learned about soil to help your planet.

Your scientist friend,
Sentences Starters for Intermediate Students

First,  ________________

Next,  ________________

Then,  ________________

Finally,  ________________

We used the ________________ to ________________

The soil smells __________

The soil feels __________

The soil looks __________

The soil sounds __________

The temperature was ________________

The soil drained in ________________

The soil was ________________

Soil has _______ in it.

Soil is made of ________________
Dear


From
Letter Guide for Beginning Students

Dear ________________,

We finished our test of the ________________.

First we used the ________________ to check the ________________ of the soil. Then we used the ________________ to look at the soil. Next we used the ________________ and ruler to see how the water drained. Finally, we used the ________________ to test how hard the soil was.

Good luck,

__________________________

soil

aliens

ruler

can

magnifying glass

thermometer

compaction stick
Soil

pink
leaves
cool
rocks
quiet
money
brown/black

music
small pieces
layers
soft
red
leaves
cool
rocks
quiet
shhh!
$ $$ money
wet
music
small pieces
layers
brown / black
SOIL
SOIL

- Soft
- Wet
- Leaves
- Cool
- Rocks
- Quiet
- Small pieces
- Layers
- Brown/black
- Money
- Sounds
- Has
- Is made of
- Smells
- Feels
- Pink
- Music
The first key element of making content comprehensible to ELL students is to provide students with opportunities to build background knowledge. In this lesson students will complete a graphic organizer and discuss what they already know about soil. At the end of the lesson, students will complete the same graphic organizer to show how much they learned about soil. Students will also have the opportunity to participate in a modified Go To Your Corner activity where they will share predictions based on their own knowledge about what types of experiments will be performed as they touch and observe the tools to be used in the study.

To help the clarity of presentation, to make directions more explicit and to help develop a rich content vocabulary, I have included visuals aids in each activity and will use the same visual aids throughout the unit. Moreover, students will use the realia presented in a demonstration by the teacher in the completion of their experiment. The lesson also includes a summary activity where students organize the components/descriptions of soil into a web graphic organizer.

In order to create more extensive opportunities to negotiate meaning, students will be working in more small groups and pairs than was allotted in the original plan. The nature of completing an inquiry based study in small groups also provides many opportunities for students to interact with the world and negotiate meaning with the teacher, their group and themselves.

Although the reading text in this lesson is minimal, it has been modified to meet the needs of all students. I increased font size and spacing in each letter providing a large font size with the most spacing for students at a beginning ESL level. Passages were modified with
simpler language and the beginning level was provided with pictorial support to help decontextualize the information presented.

In this lesson plan, to help make classroom talk comprehensible, I used the “chunk and chew” principle to guide the activity. During the whole lesson, I do not present more than ten minutes worth of information without allowing the students to participate in some activity that allows them to recall, summarize, predict or investigate on their own or in groups, ensuring that students are not bombarded or overwhelmed with auditory information. All directions presented for the investigation will be presented several times in various formats (audio tape, teacher demonstration, student summary and finally on a picture supported lab sheet). Also, there will be a word wall available in the room for the teacher to reference during discourse.

As ESL students perform better by conducting hands on experiments before delving into the instructional content of the topic I chose to make this lesson the first lesson of the unit instead of where it is suggested in the original unit. I also allow students to observe and predict what each investigation tool will be used for before they are told and shown the tool’s proper function.
Lesson 2
**Language Objectives:**
Students will be able to:
- In small groups, discuss the experimental results using comparisons and key vocabulary
- Read a chapter of a non-fiction book about soil

| Domain   | Topic                          | Starting                                                                                                                                                                                                 | Emerging                                                                                                                                                                                                 | Developing                                                                                                                                                                                                 | Expanding                                                                                                                                                                                                 | Bridging                                                                                                                                                                                                 |
|----------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Speaking | Results from a percolation test | Talking with the teacher, complete oral prompts using the words “more” or “less”. *                                                                                                                  | In pairs using sentences starters, students make simple comparisons between group’s data.                                                                                                                     | In small groups, using sentences starters, students summarize the experimental results using comparisons and a list of key vocabulary                                                                 | In small groups, discuss the experimental results using comparisons and a list if key vocabulary to include                                                                                              | In small groups, discuss the experimental results using comparisons and key vocabulary                                                                                                           |
| Reading  | Chapter about contents and types of soil | Working in pairs, students will read a modified text summarized by the teacher with picture support.                                                                                                    | Working in pairs, students will read portions of a selected chapter from a non-fiction text with important text highlighted and summaries written by the teacher. | Working independently, students will read portions of a selected chapter from a non-fiction text with important text highlighted and summaries written by the teacher. | Working independently, students will read a selected chapter from a non-fiction text with key words highlighted and notes from the teacher to clarify vocabulary. | Working independently, students will read a selected chapter from a non-fiction text with key words highlighted.                                                                                                                                                  |

* Teacher says, “___ absorbs more or less water than ____,” and student responds with “more” or “less.”
<table>
<thead>
<tr>
<th>Function</th>
<th>Situation</th>
<th>Expression</th>
<th>Words</th>
<th>Grammar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe</td>
<td>How a soil sample appeals to the senses (from perspective of the soil)</td>
<td>I → look _____ → smell _____ → feel _____</td>
<td>Dark, brown, lumpy, different in places Wet, old, musty, Wet, cool, rough, hard/soft, different in places Brown/Black dirt, sand, rock, leaves</td>
<td>Adjectives</td>
</tr>
<tr>
<td>Compare</td>
<td>Absorption of water in different soil types</td>
<td>Soil with <strong><strong>(1)</strong></strong> absorbs <strong><strong>(2)</strong></strong> water than soil with <strong><strong>(3)</strong></strong>.</td>
<td>1) Clay, silt, sand 2) More, less 3) Clay, silt, sand</td>
<td>Comparisons</td>
</tr>
<tr>
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<td></td>
<td>Water passed through <strong><strong>(1)</strong></strong> soil <strong><strong>(2)</strong></strong> than through <strong><strong>(3)</strong></strong> soil</td>
<td>1) Wet, dry 2) Faster, slower 3) Wet, dry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group <strong><strong>(1)</strong></strong>’s sample absorbed the <strong><strong>(2)</strong></strong> water.</td>
<td>1) One, two, three, four, five 2) Most, least</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group <strong><strong>(1)</strong></strong>’s sample absorbed <strong><strong>(2)</strong></strong> water than group <strong><strong>(3)</strong></strong>.</td>
<td>1) One, two, three, four, five 2) More, less 3) One, two, three, four, five</td>
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</tbody>
</table>
Modified Unit: Lesson Plan Two

*Lesson Plan format was taken from a SIOP template in Making Content Comprehensible for English Language Learners: The SIOP Model by Echevarria, Vogt and Short.

LESSON TOPIC:
Completing a soil percolation test

OBJECTIVES:
Content objective:
Students will be able to execute a soil percolation experiment and analyze the results of how water passes through different soil types.

Language objectives:
Students will be able to:
- In small groups, discuss the experimental results using comparisons and key vocabulary
- Read a chapter of a non-fiction book about soil

LEARNING STRATEGIES:
Building background knowledge, graphic organizers, work in groups and pairs, modeling, student inquiry, listening guides, hands-on interaction, visual aids, demonstration

KEY VOCABULARY:
Soil, drain, observe, wet, dry, investigate, looks, feels, soil percolation test, water, absorb

(Have vocabulary available on a word wall)

MATERIALS:
5, 2-liter plastic soda bottles cut in half (discard bottom half), rubber bands, cheese cloth, large index cards, overhead projector, timers, 5 plastic graduated cylinders, 5 plastic jars, aluminum pie plates, magnifying glasses, diverse soil samples (see below), Samy the Soil Sample sheet, listening guides, group data collection sheets, A True Book: Soil, by Christin Ditchfield

MOTIVATION/BUILDING BACKGROUND:
1) Using index cards, create “mini puzzles” (end slot in binder). Give each student one puzzle piece and then explain that each student must find the other members in their group and working together, answer the question formed on their puzzle. To make the puzzle pieces:
   a. On different colored large index cards write one of the following questions on each card:
      i. What does soil feel like?
      ii. What does soil look like?
      iii. What does soil smell like?
      iv. What are five words that describe soil?
v. What tools can we use to examine soil?
   b. Cut each index card into four puzzle pieces.

2) Have each group read their question to the class and share their answers, reviewing the important characteristics discussed about soil from the day before. Be sure to highlight key vocabulary used on the word wall.

PRESENTATION:

1) Distribute to each group a unique soil sample you (the teacher) have collected from home (and maybe a sample or two from the previous day’s study). For example you may collect a sample from school, from home, compost, sand, and peat moss. Also distribute magnifying glasses and a Sammy the Soil Sample sheet.

2) Using your own soil sample, model on the overhead projector how to complete the Sammy the Soil Sample sheet (p. 1) and model using a “Think Aloud” the types of questions you should ask yourself while observing. Sample questions may include: “How could I describe this soil in words? What is this soil made of? How does the soil feel when I touch it?”

3) Next, have students work in groups to complete the soil sample sheet where all students are offering ideas but only one volunteer student records. When all groups have finished, ask one student to share their completed Sammy the Soil Sample cartoon with the class.

4) Introduce the word absorb. Have a sponge, a piece of paper and a rock available along with a flat surface that has water poured onto it. Tell students that absorb means to suck up and hold onto water. Ask students which object might absorb more water, the sponge, paper or rock? Have three volunteers come and try and absorb the water on the surface using one of the objects. Which one had the most success?

5) Introduce the vocabulary more, less, most and least for making comparisons. Teach the language constructions required for making comparisons based on the absorption demonstration with the paper, rock and sponge:
   - The rock absorbed _____ water than the sponge
   - The paper absorbed _____ water than the rock
   - The sponge absorbed _____ water than the paper
   - The rock absorbed the _______ water
   - The sponge absorbed the _______ water.

6) Tell students that soil samples are different and that like a sponge, some types of soil absorb a lot of water and like a rock, some soil does not absorb a lot of water.

7) Introduce the non-fiction book, A True Book: Soil, by Christin Ditchfield. First, cover the title of the book and looking at the picture on the front cover, have students discuss with a partner what some possible titles of the book might be and why they think that is a suitable title. Next, take a quick tour, or picture walk, of the book to see if students can identify if the book is fiction or non-fiction and why.

8) Distribute copies of the chapter called, “Types of Soil,” and have students choose to read alone or aloud in pairs. Distribute modified texts to students of different levels: Level 1 Beginning students receive a re-written summary with additional picture support (p. 12), Level 2 Intermediate students receive authentic text with notes and highlighted information (p. 7-11), and Level 3 students receive authentic text with key vocabulary highlighted (p. 2-6).
9) Return to the large group and ask a few students to share something they learned from reading. Then create a simple graphic organizer that compares the amount of water held by each component (clay, silt, sand) in soil:

Most water

↓

Least water

End Day 1

Start Day 2

**REVIEW/BACKGROUND KNOWLEDGE (FROM DAY BEFORE):**

1) Have three circles of different sizes cut up and the labels of clay, silt and sand prepared on sentence strips. First, working as a whole class have students match up the particle size to its corresponding name. Then discuss which holds the most and least water.

**PRACTICE/APPLICATION:**

1) While giving the following instructions, hold up each instrument and/or demonstrate each step:

a. Today you are going to work in groups
   To complete a **soil percolation test** [point to vocab card on Word Wall (for all bold words)].
   Who can remember [point to head]
   What happens in a **soil percolation test**?

b. To do this test, first you need to
   Take your old soda bottle [hold up in the air]
   And your cheese cloth [hold up in the air]
   And using the rubber band [hold up in the air]
   Put the cloth on the small neck of the bottle [demonstrate].

c. Next, pour your **soil** into the bottle [demonstrate]
   Only about half way full [mark on bottle with a marker].

d. Then, put your bottle with **soil** [hold up in the air]
   And place it in the plastic jar [demonstrate]
   This is how we will set-up the test
   To **observe** how **water** passes through **soil**.
2) Continue to give the following directions in the manner above with frequent pauses and demonstration:
   a) Students will take a graduated cylinder filled with 100 mL of water and pour the water over the sample, having students recording the time the second their partner begins to pour water over the sample.
   b) Once all the water has drained from the soil, the Timer will stop the clock and record the amount of time it took for water to pass through the sample.
   c) Students will then pour the water collected in the jar into the graduated cylinder to measure how much water was absorbed by the soil. Students should also note the color and contents of the water.
   d) Students will then repeat the experiment now using a wet soil sample.
3) As a class, review the steps of the experiment again and write a list (highlighting transition words) of simplified directions on a piece of chart paper with picture support for all students to follow during the experiment. Have students demonstrate each step. Example of written instructions:

   First, pour water on the dry soil.

   Then, start the timer.

   Next, stop the timer when the water stops dripping.

4) Have materials that are required for completing the experiment available to each group (pre-cut soda bottle, cheese cloth, rubber band, plastic jar, timer, soil sample, graduated cylinder, water, group lab sheet (one per group, p.13)).
5) Assign one of the following roles to each member of the group:
   a. Timer – Uses the stop watch and records the time during the experiment
   b. Material Collector – Collects, returns and sets-up the materials for the experiment
   c. Water Pourer – Pours water through the soil sample and measures the amount of water absorbed by the samples
   d. Writer/Note taker – Records the data and observations made by the group on the group lab sheet
6) Allow students to conduct experiment being sure they are following correct procedures and noting the required information for the data sheet.

**REVIEW/ASSESSMENT:**
1) Bring the group back together and discuss the following questions:
   a. Which sample absorbed more water, the wet or the dry?
   b. How fast did the water drain through your dry sample? In which group did it drain the fastest? The slowest?
c. How fast did the water drain through your wet sample? In which group did it drain the fastest? The slowest?
d. How did the water that drained through the dry soil look? How did the water that drained through the wet soil look? Was there a difference?

2) Have each group record the amount of water their dry sample absorb during the percolation test and then stand in order from the group whose sample absorbed the most to the group whose sample absorbed the least.

3) Doing a “Think, Pair, Share,” ask students to first think to themselves and predict which soil contained the most clay particles and why. Then have students share that prediction with a partner and finally to the whole class.

4) Conclude by doing an “Up or Down,” activity to check comprehension/understanding. Say each of the statements below and if students agree with the statement, ask them to stand up. If they disagree with the statement or think it is untrue ask them to sit down or remain seated.
   a. Soil is made up of sand, silt and clay.
   b. Silt can absorb a lot of soda.
   c. Wet soil absorbs less water than dry soil.
   d. Soil with clay can absorb the most water.
   e. A soil percolation tests tells us what soil looks like.
   f. All soil is the same.
   g. Soil with a lot of sand cannot absorb a lot of water.
   h. Your teacher is smart and funny.
I am made of

I feel

I look

I smell

Samv the Soil Sample
There are many different kinds of soil. Soil may be brown, black, or even red! Some soil feels rough. Other soil feels soft. The texture, or feel, of the soil depends on the type of rock that the soil came from. Scientists tell us that all types of soil have a mixture
of three main ingredients, which are **sand**, **silt**, and **clay**.

**Soil can be many different colors.**
Soil that is mostly made of sand feels gritty or rough. If you look at it closely, you will see small pieces of broken rock. Sandy soil is the heaviest soil. It dries quickly after the rain. Soil that contains a lot of silt is grainy. It also has little pieces of rock in it, but you would need a magnifying glass to see them. Silty soil takes longer to dry than sandy soil.

Soil that has more clay in it feels slippery smooth. Clay
The soil in Georgia has lots of clay particles, giving it a reddish color.

particles are the smallest and lightest of all soil particles. The pieces of rock are so tiny that
they cannot be seen. The biggest clay particle is five hundred times smaller than a single grain of sand! This type of soil gets sticky and muddy when it is wet. It takes the longest time to dry.

When soil has equal amounts of sand and silt, with a little bit of clay mixed in, scientists call it loam. Plants grow best in loam, because this soil holds just the right amount of nutrients, water, and air.
Types of Soil

There are many different kinds of soil. Soil may be brown, black, or even red! Some soil feels rough. Other soil feels soft. The texture, or feel, of the soil depends on the type of rock that the soil came from. Scientists tell us that all types of soil have a mixture (mezclado).
Soil can be many different colors.

Parts of three main ingredients, which are sand, silt, and clay.

3 most important parts of soil: sand, silt, clay.
Sandy soil feels rough.
Silty soil feels grainy.
Clay soil feels smooth.

Soil that is mostly made of sand feels gritty or rough. If you look at it closely, you will see small pieces of broken rock. Sandy soil is the heaviest soil. It dries quickly after the rain. Soil that contains a lot of silt is grainy. It also has little pieces of rock in it, but you would need a magnifying glass to see them. Silty soil takes longer to dry than sandy soil.

Soil that has more clay in it feels slippery smooth. Clay

like Play-Dough
The soil in Georgia has lots of clay particles, giving it a reddish color.

Particles are the smallest and lightest of all soil particles. The pieces of rock are so tiny that
they cannot be seen. The biggest clay particle is five hundred times smaller than a single grain of sand! This type of soil gets sticky and muddy when it is wet. It takes the longest time to dry.

When soil has equal amounts of sand and silt, with a little bit of clay mixed in, scientists call it loam. Plants grow best in loam, because this soil holds just the right amount of nutrients, water, and air.
Types of Soil:
Modified for Beginner Students

There are many different types, or kinds, of soil.

There are three important parts in soil: sand, silt, and clay.

Each part of the soil is a different size.

- sand
- silt
- clay

Sand is the **BIGGEST**. Clay is the **smallest**.

Soil with a lot of clay **can absorb** a lot of water. 

Soil with a lot of sand **cannot absorb** a lot of water.
# Soil Percolation Test Group Data Sheet

<table>
<thead>
<tr>
<th>A. Time for water to drain</th>
<th>Dry Sample</th>
<th>Wet Sample</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Amount of water you poured</td>
<td>100 mL</td>
<td>100 mL</td>
<td></td>
</tr>
<tr>
<td>C. Amount of water drained (in the jar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Amount of water in the sample (B-C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Description of water in jar (color, materials floating)</td>
<td>The water looks...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Matt Hajdun  
Content Based Instruction  
Descriptive Narrative  
Lesson 2

As building background knowledge is especially important to ELL students, I have provided two activities for students to activate their background knowledge based on their knowledge obtained from the day before and additional knowledge (both through the content and linguistically) they bring to the class. In the first activity, students participate in a 'catch' where by finding groups based on a puzzle piece, their interest in the contents of their puzzle piece and who will end up in their group provides students with an initial excitement to interact with the lesson's content. The group work also provides students with additional opportunities to interact with one another.

For the reading component of this lesson, text was modified for three levels to make it more comprehensible. I wanted both advanced and intermediate students to experience the authentic text so the authentic text was modified (through notes and highlighting selected texts or important words). Beginning students have the chance to receive all of the important information discussed in the chapter but through a supported, simpler summary text at their level. After reading the text, knowledge is tied down through a discussion and a graphic organizer highlighting the critical points addressed in the reading.

Like in lesson one, students are provided with an opportunity to actively engage in the material by preforming a hands-on experiment. In this experiment students are working in groups and each member has a job. Jobs were assigned so that each participant could have an active role in the process, however, certain jobs are less linguistically demanding to help students feel comfortable and also participate equally in the content activities.

For an assessment activity instead of a paper and pencil test, students become active in
demonstrating their knowledge by simply standing up or sitting down to show agreement or disagreement with statements made by the teacher.

Similar to lesson one, this lesson also provides many opportunities for extended talk, modeling, demonstrations, visuals and realia, as well as the use of a continual word wall which all benefit ELL students.
Lesson 3
**Language Objectives:**
Students will be able to:
- Discuss their opinions about soil erosion in groups
- Sequence the events of a story read aloud
- Individually, write a recipe for soil that does not erode

<table>
<thead>
<tr>
<th>Domain</th>
<th>Topic</th>
<th>Starting</th>
<th>Emerging</th>
<th>Developing</th>
<th>Expanding</th>
<th>Bridging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking</td>
<td>Opinions about soil erosion</td>
<td>Select a side in the room that reflects their opinion and state that erosion is good or bad with the teacher</td>
<td>In pairs, with oral language prompts state their opinion</td>
<td>Using sentences starters or oral language prompts from the teacher, give their opinion about soil erosion and support it with one reason or thought</td>
<td>Give their opinion about soil erosion and support it with two reasons or thoughts</td>
<td>Give their opinion about soil erosion and support it with two reasons or thoughts</td>
</tr>
<tr>
<td>Listening/Reading</td>
<td>Events in a story about erosion</td>
<td>Working in pairs, students order a set of story events by placing the correct number of the event next to labeled pictures</td>
<td>Working in pairs, students order a set of story events by placing the correct number of the event next to simplified sentences with pictures</td>
<td>Working alone, students order a set of story events by reading a simplified summary of the text supported with pictures and placing the correct number by the event</td>
<td>Working alone, students order a set of story events by reading a simplified summary of the text and placing the correct number by the event</td>
<td>Working alone, students order a set of story events by reading a simplified summary of the text and placing the correct number by the event</td>
</tr>
<tr>
<td>Writing</td>
<td>Contents of a soil tray</td>
<td>Students copy from a list with picture support the items they included in their soil that does not erode</td>
<td>Students select words from a list with picture support to complete fill-in sentences about the items they included in their soil that does not erode</td>
<td>Students select words to complete fill-in sentences about the items they included in their soil that does not erode with a word bank</td>
<td>Using sentence starters students write in complete sentences a recipe for soil that does not erode</td>
<td>In complete sentences, students write a recipe for soil that does not erode</td>
</tr>
<tr>
<td>Function</td>
<td>Situation</td>
<td>Expression</td>
<td>Words</td>
<td>Grammar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------</td>
<td>----------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Give opinions</td>
<td>State opinion about erosion</td>
<td>I think that erosion is _______</td>
<td>A good thing, a bad thing, in between</td>
<td>Verb agreement, Pronouns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>He/She thinks that erosion is ________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence events</td>
<td>Order the events in a story</td>
<td>First, Second, Next, Then, After that, Finally</td>
<td></td>
<td>Transition words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare</td>
<td>Analyze the results of an erosion</td>
<td>Group (1)'s sample absorbed (2)'s water than group (3)'s sample.</td>
<td>1) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>experiment</td>
<td></td>
<td>2) More, less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group (1)'s sample absorbed the (2)'s water.</td>
<td>1) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Most, least</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group (1)'s tray was (2) eroded than group (3)'s tray.</td>
<td>1) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) More, less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group (1)'s tray eroded the (2).</td>
<td>1) One, two, three, four, five</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Most, least</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Modified Unit: Lesson Plan Three

Lesson Plan format was taken from a SIOP template in Making Content Comprehensible for English Language Learners: The SIOP Model by Echevarria, Vogt and Short.

LESSON TOPIC:
Erosion of soil

OBJECTIVES:
Content objective:
Students will be able to identify two factors in nature that cause erosion and demonstrate an understanding of how to prevent soil erosion through a simulation experiment.

Language objectives:
Students will be able to:
- Discuss their opinions about soil erosion
- Sequence the events of a story read aloud
- Write a recipe for soil that does not erode

LEARNING STRATEGIES:
Building background knowledge, graphic organizers, interactive stories, modified speech, work in groups and pairs, modeling, student inquiry, hands-on interaction, visual aids, demonstration

KEY VOCABULARY:
observe, erosion, rocks, dirt, wind, water, boulder, pebble, opinion, silt, sand, clay

(Have vocabulary available on a word wall)

MATERIALS:
Paint trays, large amount of soil, watering can, twigs, grass seed, pea and radish seeds, fallen leaves, rocks, grass clippings, pine needles, large plastic container, pictures of erosion, erosion opinion signs (good thing, bad thing, in between), Erosion Read Aloud story, Erosion Story Sequencing Activity Sheet, sample soil recipe.

MOTIVATION/BUILDING BACKGROUND:
1) Show students a large rock and a bag of sand. Tell students that many years ago the bag of sand used to be a rock. Share with students that there are two powers in nature that were strong enough to change solid rock into sand.

2) Have student participate in a “Think, Pair, Share” activity. Pose the question, “What two things in nature could make big rocks turn into sand?” Give students about 30 seconds to think of answers alone. Then have students discuss their thoughts for a minute with a partner. Finally, call on a few pairs to share with the class their thoughts. Write a list of all these possibilities on a piece of chart paper for review later in the lesson.
3) Introduce the word erosion by stating that erosion is a process caused by nature that causes soil to move and soil to be created. Show a few different pictures (p. 1-3) of the effects of erosion discussing what happened in the picture but NOT what caused the effects (will be discussed below).

4) On one side of the room, have a sign the says, “Good thing,” with a smiley face on it (p. 4). On the opposite side of the room have a sign saying, “Bad thing,” with a sad face on it (p. 5) and then in middle have a sign saying “Not sure” or “Erosion is in between,” with a content face on it (p.6). Model using the instructional phrase, “I think erosion is ______,” and give an example of a few opinions. Then, ask students who think erosion is a good thing, a bad thing and students who are not sure to meet in their areas and discuss their opinions about why they made their choice. Then ask one or two students from each group to summarize the thoughts of another member in their group by saying, “_____ thinks that erosion is a _____ thing”.

**PRESENTATION:**

1) Tell the group that they will listen to and participate in an active story about erosion (p.7-8). In this story, students will have to listen for key vocabulary and act out/speak different parts after hearing certain words. Teach students the different roles they will have to play according to the chart below:

<table>
<thead>
<tr>
<th>Word</th>
<th>Action/Sound</th>
</tr>
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<tbody>
<tr>
<td>Shrinking</td>
<td>All students hold hands out wide and making a shrinking sound effect (decided by teacher) students move hands in together until they are almost touching</td>
</tr>
<tr>
<td>Wind</td>
<td>All students move fingers rapidly in front of their mouth as they blow out</td>
</tr>
<tr>
<td>Water</td>
<td>All students put their arms out in front of them and wiggle back and forth like a meandering river, saying “Splash, splash, splash.”</td>
</tr>
<tr>
<td>Boulder</td>
<td>1/3 of the students make themselves look bigger and make muscles, saying “Big and strong,” in a deep voice</td>
</tr>
<tr>
<td>Rock</td>
<td>1/3 of the students will hold their pointer and pinky finger up in the air while nodding their head and say, “I wanna rock!”</td>
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<tr>
<td>Pebble</td>
<td>1/3 of the students move their index and point finger closely together and say, “Oh so small,” in a little squeaky voice</td>
</tr>
</tbody>
</table>

The first three roles are assigned to the whole class and for the last three roles, the teacher needs to divide the group into thirds and assign one role to each group. Remind students that after listening to the story, they will be asked to order the events in the story.

2) Read the story, **How the Boulder Changed** (p. 7-8), aloud to the class, *pausing for one-two seconds at each line break.*

3) Pass out the “Erosion Story Sequencing Activity,” (p. 10-11 based on student level) and have students complete the work alone or in pairs. After completing the work, as a whole class, orally summarize the story using transition words.
4) Review the list of ideas students had at the beginning of the lesson on what two forces of nature could have changed rock into sand. After hearing the story, ask students what are the two powerful forces of nature that cause erosion? Were those forces on the original list?

5) End the day by briefly discussing whether students believed that in the story erosion was a good thing, a bad thing or maybe a mix of both.

End Day 1

Start Day 2

**Practice/Application:**

1) Demonstrate a sample soil erosion simulation with a soil sample that has not root structure to prevent erosion. Fill a paint tray with sand and then angle the paint tray on top of about 5 textbooks. At the bottom of the tray, have a large plastic collection bin to collect runoff. Using a watering can filled to the top, pour water over the soil sample holding the spout about 6 inches from the soil. Pour until the watering can is empty. Measure how much water passed through the sample (what was collected in the bin) and ask students how the soil in the tray changed (sand should have been displaced creating river-like grooves in the sand).

2) Have students discuss in groups possible ways they could have made the soil absorb more water and prevent erosion of the soil.

3) After brainstorming have available for each group one paint tray, large amount of soil (of different varieties), a watering can, twigs, grass seed, pea and radish seeds, fallen leaves, rocks, grass clippings, and pine needles. Students will work together to create soil trays that will prevent erosion of the soil. Make sure students note the components (and the amounts), that they are adding to their soil sample.

4) After completing their soil tray, each student will write a recipe for their soil sample (p. 12 for Advanced students, p. 13 Intermediate, and p. 14 for Beginner), summarizing the components they added to their tray. Before sending students off to work alone, model using a “Think Aloud” technique a sample soil recipe on chart paper or on the overhead. “Share the Pen,” with students allowing them to add in completed thoughts.

5) Leave samples to grow and start to root for 1-2 weeks.

6) Have students share their soil recipes with a partner.

**Review/Assessment:**

During the following one-two weeks, continue to teach on other related themes about soil/rock cycle. When soil trays are ready, review and assess the concept of soil erosion by the following:

1) Demonstrate once again an example of soil erosion when there is no root system in place to hold soil together (Practice/Application 1 above).
2) As a whole class, have each group run the soil erosion test on their samples and examine how much soil is displaced in the collection bin as well as the total volume of water collected (not absorbed). Note the amount of water absorbed by the sample on chart paper.
3) Order samples from the soil that absorbed the most water to the sample that absorbed the least water and review the recipes for each sample.
4) Create a class graphic organizer that describes what soil needs to prevent erosion.
Erosion is a GOOD THING
Erosion is a BAD THING
I am not sure.

Erosion is in between.
Erosion Read Aloud Story

How the BOULDER Changed
By Matt Hajdun

One day
a long, long time ago,
there stood a BOULDER.
The BOULDER
thought he was the greatest
and strongest BOULDER
in the world
and that no one
could ever change him.
The BOULDER
lived next to
a group of ROCKS
and a lot of PEBBLES
that made up the soil
all around him.

The BOULDER
would often laugh at
and make fun of
the ROCKS
and PEBBLES.

One day
the BOULDER
talked to them and said,
"Look at how small you are.
What good can you
possibly do for the Earth?"

"Together
we make up soil
and hold WATER
in the ground
for plants to use."
Said the ROCKS
and PEBBLES
together.

The BOULDER laughed.
"It does not matter
what your job is to me.
I will always be
bigger and stronger
and more important
than you," he said."

"A long time ago
we were like you."
said one brave ROCK.

"You were like me?"
laughed the BOULDER.

"Yes,"
said the PEBBLE,
"but over millions
and millions of years
the soft WIND
and the always moving WATER
made us small."

The BOULDER
could not believe
that two things like
WATER
and WIND
could ever be strong enough
to break him apart.

For millions of years
the BOULDER
sat by the river
watching the WATER
flow by him
and feeling the WIND
pass by
without thinking about
what the others had said.

Then one day
he noticed,
that he no longer felt
as big as he once did.
He looked behind him
to see that a long time ago,
he was the biggest BOULDER
in the land,
but now,
he had shrunk,
and was just the size
of a big ROCK.
The WATER
had washed part of him away.
And the WIND,
that WIND,
had blown away millions
of small pieces.

The ROCK
became nervous.
He did not want to be small
like a PEBBLE.
But he told himself
not to worry.
He did not have to change.
He would just stop
the WIND
and the WATER
from making him smaller.
He would stay a tough
and sturdy ROCK
forever.

But, for many more years
the WIND
continued to blow by
and the WATER
flowed on and on,
every second,
making the ROCK
a little weaker
and a little smaller.

Then one day,
the ROCK
looked at his reflection
in the WATER
as it passed by
and saw that he was
nothing more than
a small PEBBLE.

And the PEBBLE
began to cry.
"I used to be a BOULDER,"
he said out loud.
"Tall and heavy and proud,
but then all that WIND
and WATER
made me a weak
and small ROCK.
But it did not stop there.
That WIND
kept blowing
and the WATER
kept rushing until
I turned into this,
a weak, little PEBBLE.

Just then
the WIND blew,
carrying along
a small seed.
"I do not think
you are weak,"
said the maple samara
landing beside the PEBBLE.
"I think you are very strong
and I need your help.
I need something
to start growing
my roots around."

The PEBBLE
smiled and felt proud
once again.
He wiggled around
to make himself
the biggest PEBBLE
he could be
and then said to the samara,
"I am the right PEBBLE
for the job."

Over the next few years,
the WATER
and the WIND
passed by,
but there the PEBBLE stayed.
Wrapped around the roots
of the growing tree,
which grew to be taller
than the biggest BOUDELER
in the land.
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<td>Put arms out in front of you and wiggle back and forth like a meandering river, saying “Splash, splash, splash.”</td>
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<td>Boulder</td>
<td>Make yourselves look bigger and make muscles, saying “Big and strong,” in a deep voice</td>
</tr>
<tr>
<td>Rock</td>
<td>Hold pointer and pinky finger up in the air and while nodding your head say, “I wanna rock!”</td>
</tr>
<tr>
<td>Pebble</td>
<td>Move index and point finger closely together and say, “Oh so small,” in a little squeaky voice</td>
</tr>
</tbody>
</table>
Erosion Story Sequencing Activity

Advanced Student

___ The rock became a pebble by erosion from wind and water.

___ A seed lands beside the pebble and grows its roots around the pebble.

___ The large boulder laughed at the small rocks and pebbles because they were so tiny.

___ The pebble cried because he was no longer a huge boulder.

___ The boulder changed over time into a rock because of erosion.

Intermediate Student

___ 🤣 The rock was made into a pebble by erosion.

___ 🌿 A seed lands next to the pebble and grows its roots.

___ 🤣 The big boulder laughed at the small rocks and pebbles.

___ 🙁 The pebble cried because he was no longer a big boulder.

___ 🤣 The boulder was made into a rock by erosion.
Beginning Student

1. Rock → Erosion → Pebble
2. Seed → Pebble → Roots
3. Boulder → Rocks → Pebbles
4. Pebble → Boo Hoo
5. Boulder → Erosion → Rock
My Soil Recipe

To stop erosion, first we added a ______ of ________. Then, we mixed in some _______ and _______. Next we placed a ______ of _______ and some _______. Finally, we added some _______ and let the tray sit aside for _______ days.

Word Bank

handful cup some shovel rocks pine needles
leaves grass seed grass clippings water clay sticks
pea seeds radish seeds pebbles bucket
My Soil Recipe

We added:

1) ________________
2) ________________
3) ________________
4) ________________
5) ________________
6) ________________

Word Bank

- rocks
- pine needles
- leaves
- grass seed
- grass clippings
- water
- sticks
- pea seeds
- radish seeds
- pebbles
The original lesson from Project Seasons contains a wonderful application of the concept of erosion, however, it provides no opportunities for gathering background knowledge and all content knowledge is proposed through the application exercise and un-scaffolded discourse. For this lesson I decided to include a days worth of discussion and background information to provide students with the language and content skills necessary to make this lesson more applicable and meaningful.

In this lesson the word erosion is very important and to most third grade students it is a new content word and to ELL students it is also a new language word. Therefore, teaching of this vocabulary word through multiple activities was essential. First, to help students build background knowledge I have provided a prediction activity supplemented with realia meant to be a 'catch' to grab students' attention and interest. Students then have time to interact through a Think, Pair, Share tying down language to their predictions. Next, after viewing additional visuals of erosion, students form an opinion and defend themselves, again providing an opportunity to tie language in with newly developing content knowledge.

After this, students engage in an interactive story where they hear authentic vocabulary used and have the opportunity to focus in on this key vocabulary by applying motions and sounds when the words are read. This activity makes the reading experience engaging which is important for ELLs and allows them to tie down critical vocabulary through a third experience.

Finally, students actively engage with one another and the content by applying their knowledge in a hands-on exercise that addresses both speaking and written language skills.
As in all three lessons, this lesson includes additional opportunities for working in small groups and pairs, interacting with content materials through a hands-on simulation, extensive time in developing background knowledge and an assessment activity that relates to a graphic organizer.

For all three plans, my overall goal was to provide many opportunities for the children to learn similar language constructs or work towards consistent language goals. Instead of trying to expose students to a wide variety of language skills in which students only scratch the surface of the knowledge, I have repeated themes like comparisons, transition words and adjectives relating to soil throughout the unit so that students can experience these language components on a deeper level.
Checklists
### Functions, Grammar, Content Vocabulary and Functional Vocabulary Checklists

<table>
<thead>
<tr>
<th>Functions</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe using the senses</td>
<td>1, 2</td>
</tr>
<tr>
<td>Summarize tasks/story events</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Transition between events</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Compare results/characteristics</td>
<td>2, 3</td>
</tr>
<tr>
<td>Sequence/Order events</td>
<td>2, 3</td>
</tr>
<tr>
<td>Give opinions</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grammar</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjectives</td>
<td>1, 2</td>
</tr>
<tr>
<td>Transition words</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Comparisons</td>
<td>2, 3</td>
</tr>
<tr>
<td>Verb agreement</td>
<td>3</td>
</tr>
<tr>
<td>Pronouns</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content vocabulary</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>1</td>
</tr>
<tr>
<td>Compaction stick</td>
<td>1</td>
</tr>
<tr>
<td>Soil percolation test</td>
<td>1, 2</td>
</tr>
<tr>
<td>Soil</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Drain</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Absorb</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Water</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Clay</td>
<td>2</td>
</tr>
<tr>
<td>Silt</td>
<td>2</td>
</tr>
<tr>
<td>Sand</td>
<td>2</td>
</tr>
<tr>
<td>Wind</td>
<td>3</td>
</tr>
<tr>
<td>Erosion</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Functional vocabulary</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Looks</td>
<td>1, 2</td>
</tr>
<tr>
<td>Feels</td>
<td>1, 2</td>
</tr>
<tr>
<td>Smells</td>
<td>1, 2</td>
</tr>
<tr>
<td>Sounds</td>
<td>1, 2</td>
</tr>
<tr>
<td>Fastest/Slowest</td>
<td>2</td>
</tr>
<tr>
<td>Wet</td>
<td>2, 3</td>
</tr>
<tr>
<td>Dry</td>
<td>2, 3</td>
</tr>
<tr>
<td>More/Less</td>
<td>2, 3</td>
</tr>
<tr>
<td>Most/Least</td>
<td>2, 3</td>
</tr>
<tr>
<td>Opinion</td>
<td>3</td>
</tr>
</tbody>
</table>
**FLA 518: Sheltered ELL Strategies Checklist**

Write the page numbers and any other identifying features to identify those parts of your lessons that employ the following strategies.

<table>
<thead>
<tr>
<th>SHELTERED STRATEGIES</th>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Contextualize Lesson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. A. Build and Activate Background Knowledge</td>
<td>C, I, B</td>
<td>B, I, B</td>
<td>A, B</td>
</tr>
<tr>
<td>I. B. Use extensive Visuals, Realia, Manipulatives, &amp; Gestures</td>
<td>B, C</td>
<td>B, B</td>
<td>A, D, B</td>
</tr>
<tr>
<td>I. C. Model (Instructions, Processes)</td>
<td>B, C, D, H, N</td>
<td>C, D</td>
<td>C, D</td>
</tr>
<tr>
<td>I. D. Create Opps. To Negotiate Meaning/ Check Understanding</td>
<td>B, C</td>
<td>A, E</td>
<td>A, D</td>
</tr>
<tr>
<td>II. Make Text Comprehensible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II.A. Intentional Use of Graphic Organizers</td>
<td>15-17</td>
<td>C, I</td>
<td>D</td>
</tr>
<tr>
<td>II.B. Develop Vocabulary</td>
<td>A, B, C</td>
<td>A, B</td>
<td>A, D</td>
</tr>
<tr>
<td>II.C. Modify Written Text</td>
<td>A, 1-3</td>
<td>2-12</td>
<td>D, 12-14</td>
</tr>
<tr>
<td>III. Make Talk Comprehensible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III.A. Pace Teacher’s Speech</td>
<td>4</td>
<td>C</td>
<td>7-8</td>
</tr>
<tr>
<td>III.B. Use of Listening Guides</td>
<td>B, 4-9</td>
<td>B, 9</td>
<td></td>
</tr>
<tr>
<td>III.C. Use of Word Walls</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>III.D. Frame Main Ideas</td>
<td>A</td>
<td>A, B</td>
<td>A, B</td>
</tr>
<tr>
<td>III.E. Check for Understanding</td>
<td>C</td>
<td>E</td>
<td>D, E</td>
</tr>
<tr>
<td>IV. Engage Opportunities for Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV.A. Use Teacher Questioning and Response Strategies</td>
<td>C</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>IV.B. Practice Instructional Conversations</td>
<td>A, C</td>
<td>B</td>
<td>C, D</td>
</tr>
<tr>
<td>V. Engage at Appropriate Proficiency Levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A. Use questions appropriate for language proficiency levels in conversations, activities, and assessments</td>
<td>C</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>VI. Give Students Voice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI. A. Challenge students to produce extended talk</td>
<td>A, B, C</td>
<td>A, B, D, E</td>
<td>A, D</td>
</tr>
<tr>
<td>VI. B. Model Language for Oral and Written Production</td>
<td>11</td>
<td>B</td>
<td>B, C</td>
</tr>
<tr>
<td>VI. C. Use Group/Pr. Work to Elicit Student Talk; Students as Researchers</td>
<td>A, B, C</td>
<td>A, B, E, I, 3</td>
<td>A, D</td>
</tr>
</tbody>
</table>
Original Lessons
Objective:
Students will learn about the properties of soil through hands-on investigation.

Grade Level: 3-6

Groupings: Small groups

Materials: Introductory letter (see step #1); cardboard box covered with aluminum foil; cassette tape with message from Tridians (see step #3); cassette player.
(Per group, inside the aluminum foil covered 'space box'): Earth Investigation Worksheet (see page 65 - 66); trowel; soil thermometer; pH kit; compaction stick (1/2 inch dowels that have been sharpened at one end); coffee can with both ends removed; ruler; gallon jug for water; plastic zip-lock bag; aluminum pie pan; magnifying glass or hand lens.

Time Allotment: 20 minutes for opening activity, 30 minutes for Earth investigation, 30 minutes for skit development and 15 for presentation.

Directions:
This is a long, comprehensive activity designed to investigate the properties and importance of soil. It can easily be broken up and done over several days. It is a fantastic beginning to a subject that at first might not seem very exciting to your students.

1. Begin the activity with the following letter (or a similar one). Leave several copies around the classroom, in a manner atypical of your usual classroom protocol.

Greetings Earthling Students in Room # (list),

We are from the planet TRID. We have been watching you very closely and have seen you reading, writing, studying and asking questions. We have determined that you have all the scientific skills we've been looking for. Our planet is in deep danger, and we need your help. We are running out of all the things we need to live. We will be beaming down to your planet on (list date and time) in the Earth year (list). Please meet with us and help us solve the problem that is threatening our planet's future. May the forest be with you.

Ask the students to brainstorm a list of things they think the Tridians might be running out of. What might be the possible source(s) of their problems? Compare these to common problems on Earth and list some possible solutions.

2. On the designated day, ask the principal to bring the "Space Box" to your class. Ask him or her to play up its arrival in the school yard or office. Suggest that he or she carry it wearing fire gloves or potholders, explaining that it was glowing when it arrived. Have him or her point out that now that it has cooled, a message is visible on the top. Ask for a volunteer to read the message.

Due to strange and alien atmospheric conditions, we are unable to beam down to your planet. Instead, we are sending down this special space box. Please open it as soon as possible and listen to our story. Thank you for your help, and may the forest be with you.

3. Ask the volunteer to open the box and find a cassette tape, stressing that he or she not touch the contents until the class has listened to the Tridians' story. Then play the tape with the following recording (or something similar), recorded with a nasal Martian-like drone:
Extensions:

a. Follow up the outdoor percolation test with the indoor version presented in the activity Soil Soakers (page 67).

b. Use soil test kits to further evaluate and compare soil around the school.

c. As creative inspiration or a reminder of the importance of soil in our lives, play the song Dirt Made My Lunch from the album of the same name by the Banana Slug String Band (available from Music for Little People, P.O. Box 1460, Redway, CA 95560).

A MESSAGE from the TRIDIANS . . .

Greetings Earthlings! We are from the planet TRID. Our planet is in deep danger. It is so polluted we are no longer able to produce our own food, and our plants and animals are dying. We have detected life everywhere on your planet Earth. It appears to be lush, green, fertile and full of food. Our computers have been analyzing the reasons for this, and it appears that all food on your planet comes from a dead, brown grey substance we have heard you earthlings call soil or dirt. We find this hard to believe, but it is our last and only hope. If you will help us in our crisis, your mission is to find this substance called dirt, dissect it and record for our computers each and every ingredient. Then we will be able to manufacture dirt on our planet, and it can save us from the tragedy which is about to befall us.

We have sent down a special "Space Box" to help you with this mission. Please examine it carefully. Inside you will find the following:

1. An Earth Investigation Worksheet. Please complete each and every section.
2. Specially designed implements called truels for digging up the soil.
3. Silver dissecting trays for sorting your soil samples.
4. Hand lenses for getting a closer look at the special ingredients.
5. Compact containers to transport your soil sample through space. They are tough, they are zip-locked alligator space baggies. Please fill them to the brim with a sample of your rich Earthling soil.
6. Soil percolation kits in the form of a bottomless can with a ruler. Just add your abundant blue water!
Directions: (continued)

4. Have a few students sort the contents of the box into similar groups. Then review the Earth Investigation Worksheet and discuss how each of the tools will be used. Demonstrate how to set up the soil percolation test. Explain that the coffee can should be twisted or pushed into the ground to a depth of 1 inch. Then the can should be filled with water and the ruler, placed inside perpendicular to the ground, is used to measure the rate at which the water drains from the can. Explain that the compaction sticks will be pressed into the ground. What will this reveal about the soil? Determine how this will be tested so that all groups are using the same procedure and results are comparable. Demonstrate how to use the pH kit and discuss what pH measures. If you wish, do a pH test of a variety of common household items such as lemon juice, baking soda, and vinegar. Remind the students that the thermometer should be placed in the ground when they begin their testing and removed and recorded as they are leaving for an accurate reading. Suggest that all tests be done more than once to insure accurate results.

5. Divide the class into small groups. Ask each group to collect a complete set of “Space Box” materials plus a gallon jug full of water. Explain that each group should sample soil from a different area such as under trees, on the lawn, in a garden, or on the playground to get a good sampling of different soil types. Assign groups to a particular area and explain that they have 30 minutes to run their tests on site and complete the worksheet.

6. Bring the class together to share and compare test results. Create a chart and have the students list their results based on their sampling area. In which soil did water drain the quickest? The slowest? Which soil absorbed the most water? The least? Which soil was the most compact? The least compact? Compare the amount of air spaces in these soil. Plants need a combination of air and water in the soil to encourage healthy root growth. Which soils meet both these needs? Compare soil pHs. Most garden plants do best at a pH between 6.5 and 7. Which sites would make a good garden? To review soil ingredients, try using a giant recipe card and ask the students to list the important ingredients found in their samples. (This is a good time to do the activity Soil Recipe (page 59) or refer to it, stressing the critical ingredient of time.)
OLD FARMER'S TASTE TEST

Want to test the pH of your garden soil without using fancy equipment? Try the “Old Farmer’s Taste Test.” Just put a bit of soil on the tip of your tongue and try to determine the flavor. Do not taste soil if any chemicals have ever been applied. Is it bitter? Then your soil is too alkaline. Is it sour like a lemon? Then it’s too acidic. Does it taste sweet? Hurray, then it is probably just right for growing most plants! pH is a measure of the soil’s acidity. The pH scale ranges from 1-14, the lower numbers indicating acidic conditions, 7 being neutral and higher numbers indicating alkalinity. Here’s where some common household items fall on the pH scale: lemons, vinegar, and apple juice are acidic; baking soda, ammonia, and laundry bleach are alkaline; and water, cow’s milk, and blood are neutral. A soil’s pH is determined in part by the chemical nature of the rocks that made it, and the type of plants that live and die in it. pH affects the solubility, hence availability of nutrients important to plant growth. Most vegetables do best in the pH range 6.5 to 7. Various materials can be added to the soil to either raise or lower the pH to this desired level. So before you plant those seeds, dig in and taste your soil!

Directions: (continued)

7. Provide time for the students to work on their creative soil presentations. Encourage them to write scripts and to gather and make props to enhance their message. Then let them perform them for the class. Be sure to record their presentations on tape or with a video camera to be sent along to the planet TRID. (Incidentally, “trid” is “dirt” spelled backwards.)

Inspired by the activity Space Travelers in THE GROWING CLASSROOM by R. Jaffe and G. Appel
Earth Investigation Worksheet

Names of scientists: __________________________

Location of soil sample: __________________________

1. **TAKE THE TEMPERATURE OF THE SOIL.** Place the thermometer in the ground and perform all the following experiments. When you are finished with the experiments, record the temperature.

2. **DIG UP A SOIL SAMPLE** and fill the zip-lock baggie. Keep digging and add another soil sample to the collecting tray. Now using your senses, write down at least two words to describe how the soil:

feels: __________________________
smells: __________________________
sounds: __________________________
looks: __________________________
tastes: __________________________

3. We need to make soil to save our planet. **DISSECT YOUR SOIL SAMPLE** and list the ingredients on the card below. Use the hand lense to get a close look.
4. Perform a **SOIL COMPACTION TEST**. Using your compaction stick, measure how deep you can press it into the soil. For accuracy, try this test more than once.

How many inches into the soil can you press the stick? _______

5. Perform a **SOIL PERCOLATION TEST**. Press the can into the soil to a depth of 1 inch. Stand the ruler inside the can. Fill the can with water to the brim and time how long it takes for all the water to be absorbed into the soil. Get ready, set, pour! (Make sure the water goes into the soil and does not spill out around the edges). Try this experiment again, both in the same spot and in a new location.

How long did it take? _______
How long did it take the second time in the same spot? ______________________
How long did it take in the new location? ______________________

6. Please take the **pH** of your soil sample (follow the instructions for your kit).
What is the pH? ____________________________________

7. Now that you have finished all the experiments, please remove the thermometer from the soil. What is the temperature of the soil?

_____________________

*Thank you for your hard work. Please remember to create a message that can be shown and/or broadcast on our planet to tell our people about the importance of soil. May the forest be with you!*
**Soil Soakers**

**Objective:**
Students will observe and measure the relationship between water holding and drainage capacities of soils.

**Grade Level:** 3-6

**Groupings:** Small groups

**Materials:** (*per group*) Dry, diverse soil samples such as sand, clay, compost, garden soil, and peat moss; metal pie plate; glass lamp chimney or clear plastic soda bottles with bottom cut off; plastic window screening; rubber bands; 1-2 quart wide-mouth jar; masking tape; clear 8 oz. plastic cup; water.

**Time Allotment:** 30 minutes

**Directions:**
1. Challenge the students to collect unique soil samples from in and around their homes and gardens. Suggest they talk to gardeners to obtain special mixes or soil types. Have them bring their sample to class in a brown paper lunch bag. Ask them to keep their soil composition a secret. You might want to bring a selection of soils yourself to insure a diverse mix. Possibilities include: potting soil, compost or composted cow manure, sand, peat moss, and clay.

2. Collect and observe the students’ soil samples. Select four to six distinct samples to be used in the activity. Divide the students into small groups and assign a soil sample to each. Have each group empty their sample into a metal pie plate. Ask each member of the group to use their senses to observe the soil and record adjectives that describe their sample. Do not taste any soil if chemicals have been applied. Have the group use the words generated to create a short poem, verse or song about their sample.

3. Collect the samples and number each one. Display them in a central location. Ask the students to visit each of the samples and observe them carefully. Have each group then read their poem, descriptive verse or song and let the rest of the class try to guess which soil sample it describes.

4. Discuss the variety of soils, their basic characteristics and how each type might affect plant growth. Sand is composed of fairly large particles with rough edges, has a gritty texture, and a lot of air spaces between the particles. Clay is made of very fine particles with smooth edges. It is sticky and slippery when wet and can become hard and packed when dry. It is often hard to work. Loam is a mixture of particles sizes and has a crumbly texture and moderate air spaces. Soil rich in organic material tends to act like a sponge and hold water. Explain that the groups will be performing an experiment to investigate the water holding and drainage capacities of these various soil samples.

5. Pass out a glass lamp chimney (or plastic soda bottles or funnel), plastic screening, and rubber bands to each group. Ask them to attach the screening to the narrow end of the chimney with the rubber band. Provide masking tape and have each group label their soil sample with an identifying
Extensions:
a. Make squirt bottles for younger students by punching holes in the lids of plastic soda bottles. Fill these bottles with water and explain they will be using them to test absorption rates of different soil areas in the school yard. Divide the class into pairs and give each pair a bottle. Outside, have them squirt an area of soil with water. Is the water quickly absorbed or does it pool up? Have the pairs share and discuss their results.

b. Have students repeat outdoor percolation tests as done in Soil Trek (page 61) throughout the school yard. Be sure to choose areas where the soil is compacted from heavy use, where it is covered by grass and where it is open and loose. Collect soil samples from these areas for comparisons. Discuss results.

Directions: (continued)
name. Ask them to add their soil to the chimney to the predetermined line (each group should have the same amount of soil in their chimney). Pass out wide-mouth jars and have each group place their chimney into the jar, screen side down.

6. Have the groups place their setup in a central location with their original soil sample in the metal pie pan for observation. Explain that they will pour water into the wide end of the chimney (about 1/3 to 1/2 full) and observe and record how quickly water passes through the sample and into the wide-mouthed jar. This is called a percolation test. They will also note how much water is absorbed by comparing the volume of water before it is poured into the sample to the volume of water after it has passed through the sample. What factors do they think will affect the percolation rate? Which sample will percolate the fastest? The slowest? Suggest that they look closely and feel the samples in the metal pie plates for helpful information.

7. Ask each group to designate one student to pour water through their sample and another to monitor and record the times. Explain that when you say, “Go!” students will simultaneously pour water into the chimneys. In addition to observing and recording, the timers will announce when the first drop passes through the sample and when the water finally stops dripping steadily.
Extensions: (continued)
c. Have the students conduct an experiment to look at particle size, porosity sizes and water-holding capacity of some common materials. Give each group a cup full of marbles and one filled with the same amount of sand. Which cup has the most empty spaces or pores, the marbles or the sand? To check their guesses, give them cups containing the same amount of water. Tell them to add water until the water level is even with the top of the marbles or sand. Direct them to remove any excess water with an eyedropper and add it back to the original cup. Which holds the greatest amount of water? (The sand can hold more water than the marbles as there are more air spaces in the cup of sand.) Were they surprised? Suggest they try filling the empty spaces in a second cup of marbles with sand. How much sand can they add? Will they be able to add any water to this mixture? Record their predictions, then test by pouring in water.

Directions: (continued)
8. Discuss the results from the samples. Were there any surprises? Compare the volume of water that passed through each sample. Have the students pour the percolated water back into the plastic cups. How does it compare to the original volume? Be sure to note any differences in color and clarity.

9. Wet the soil samples in the metal pie plates. Have the students feel and describe the wet soil. Explain that they will repeat the percolation test through the wet soil samples. Explain that when evaluating soils at a building site percolation tests are done in wet soil. Do they think the results will change?

10. Compare results from wet and dry samples. What can you determine about each sample’s porosity and drainage abilities versus water retention? How would these factors influence plant growth?

SOIL SPONGES
What do a sponge and good garden soil have in common? They are both full of holes and absorb and hold water. Good garden soil is a mix of different particle sizes and rich in organic matter, with a crumbly texture and a range of air spaces. These characteristics allow for the free flow of oxygen and water through the soil, making it easier for plant roots and soil animals to work their way through. Organic materials in the soil improve absorption and water holding capacity, encouraging healthy and vigorous root growth. These materials also help to control erosion, as surface water is quickly and completely absorbed, leaving little damaging run off. Good garden soil maintains a balance between how quickly water drains through the soil and how much water is retained; hence, the soil is never too wet or too dry.
Soil on the Run

Objective:
Students will learn about soil erosion and how to control it.

Grade Level: 2-6

Groupings: Small groups

Materials: Old paint roller trays or 9 x 13 baking pans; soil; 2 to 4 bricks; watering cans; buckets filled with compost; a variety of mulch materials such as dried leaves, grass clippings, straw, Popsicle sticks, twigs, and toothpicks; selection of quick germinating seeds such as grass seed, wheat, buckwheat, or beans.

Time: 15 minutes for initial demonstration, variable time for research and soil tray preparation, 20 minutes for final experiment and discussion.

Extensions:
a. Try this activity outdoors on a sloping plot of lawn. Remove sod from several plots and test various options: mulch, terracing, addition of organic matter etc.

b. Make splash sticks to show how raindrops can loosen and move soil. Have small groups of students make their own splash sticks by attaching paper to three foot lengths of lumber with thumb tacks. Explain they will be holding these sticks vertically over

Directions:
1. Gather the students together for a demonstration. Explain that you are a New England hill farmer and you just finished harvesting and tilling up your fields. Show the students a tray full of soil which is propped up on one side with bricks, creating a slope. Place beneath the tray a collecting basin which runs the width of the tray. Tell the students it has been a rainy fall and another storm is brewing. Ask them what will happen to the soil in this field during a rainstorm. Record their predictions. Then using a watering can held one foot above the tray let it rain for 1-2 minutes.

2. Have the students examine the soil in the tray and observe the runoff collected in the basin. Pour it into a clear jar for closer inspection. (They should see gullies formed in the tray, and perhaps large areas where the soil was washed away. The water in the collecting basin will be muddy and full of sediment.) Have them test the soil at various depths to see how much water was actually absorbed. Discuss the results and what this means with regard to soil and plant health.

3. Explain to the students that soil erosion is a serious problem facing farmers throughout the world. Every year 3 billion tons of topsoil is lost, and it is the topsoil that is responsible for the soil fertility. Remind them it takes 100 years to make an inch of new topsoil. Challenge the students to reduce the amount of erosion that occurs on sloping farm fields.

4. Divide the students into small groups and give each two trays to be filled with soil. They will need to research and discuss possible options for controlling erosion in these field. Possible options should include mulch covers, contour plowing, cover cropping, terracing, and addition of organic materials to soil to improve water absorption.

5. Provide materials for students to use on their fields including compost, various forms of mulch, twigs, Popsicle sticks and toothpicks (for creating terraces, water bars and roots), and seeds. Decide with the students a time limit for research and preparation. It can vary greatly depending on the students' desires to experiment with cover crops and planting patterns.
Extensions: (continued)

b. Use the remains of the paper to create a compost pile. Compost is a mixture of organic matter that has been decomposed by microorganisms. Ask the students to record the amount of compost produced over time.

c. Go on a erosion walk around the school yard to identify where erosion is occurring. Have the students suggest solutions to these problems and try to implement their ideas.

d. Study the Dust Bowl era and how the health of the soil affected people's lives. The Dust Bowl era, which occurred in the 1930s, was a time of severe drought and dust storms that caused widespread soil erosion. The story of the Dust Bowl is a powerful reminder of the importance of soil conservation.

Directions: (continued)

6. On the day of the experiment set up the trays and have the students present their methods for erosion control. Have all groups pour the same amount from a set height onto the sloping field. Examine the runoff of each field, noting clarity, color and amount collected. Which methods were most effective at controlling erosion?

TREATING SOIL LIKE DIRT

Erosion, the wearing away of soil by water, wind, and ice is a major problem threatening our survival. How can that be, since soil is underfoot everywhere? The problem lies in our nutrient-rich topsoil and our use of this precious resource. Imagine the Earth as an apple with the skin representing all the soil. Only the topsoil, the first few inches of soil, is good for growing crops. Yet, every year over 3 billion tons of soil are lost. And replacing it takes 100-200 years or more per inch of topsoil! At this rate it won't be long before our topsoil is depleted. But people are taking erosion seriously and time, energy, and money are being devoted to solving this problem. Governments are spending billions of dollars teaching farmers everything from organic matter enhancement to improve soil quality and infiltration, to effective vegetation cover cropping to modern conservation tillage methods. Before long we hope to be in the black, black rich soil that is!
SHELBURNE FARMS

PROJECT SEASONS

Hands-on activities for discovering the wonders of the world.

written by Deborah Parrella

illustrated by Cat Bowman Smith
Appendix
Sentence Strips

Lesson
Thermometer
digs a sample

Shovel
looks up close

Magnifying glass
Compaction stick
finds how hard
measures water
that drains
Soil Size
Activity
Lesson 3
Silt

Clay

Sand
Puzzle Activity Lesson 2
What does soil look like?
What does soil feel like?
What does soil smell like?
What are five words that describe soil?
What tools can we use to examine soil?