Step 1: Develop your “big idea” or “big question”

Why is soil important in our life?

This is important for students to learn about because everyone is affected by the soil even though we don’t think about it very often. It has a vital role in building, agriculture and many other businesses.

Step 2: Determine and write out your goals and objectives.

• Students will become aware of the importance of soil.
• Students will gain a basic knowledge of soil.
• Students will learn about soil horizons.
• Students will gain knowledge of different types of soil texture.
• Students will be able to determine which soils are best for different kinds of activities.

Step 3: Develop your inquiry questions. These are sub-questions to the “big ideas” or questions and help build the students understanding of the facts, concepts, and generalizations that will be used to answer the “big” question. It is like building a case for your inquiry.

What is soil?
What does it do?
How does soil erode?
How does soil affect development of buildings?
How does the climate affect the soil?
What happens when a soil gets polluted?
What lives in the soil and why is it important?
How are humans affected by the soil?
How have humans affected the soil?
How does the soil affect our foods growth?
Is there enough soil to go around?
How did it form?
Can it be created?
Standards:
National:
- III.e describe, differentiate, and explain the relationships among various regional and global patterns of geographic phenomena such as landforms, soils, climate, vegetation, natural resources, and population
- III.h examine, interpret, and analyze physical and cultural patterns and their interactions, such as land use, settlement patterns, cultural transmission of customs and ideas, and ecosystem changes
- III.k propose, compare, and evaluate alternative policies for the use of land and other resources in communities, regions, nations, and the world.

State:
Geography:
- V.C. The students will analyze the patterns of location, functions, structure, and characteristics of local to global settlement patterns and the processes that affect the location of cities.
- V.D. The students will describe how humans influence the environment and in turn are influenced by it.

Step 4: Find and collect resources including primary sources if possible. There are a lot of links on these 3 sites.
- http://www.soils.org/sssagloss/
- http://school.discovery.com/schooladventures/soil/

Step 5: Develop how you will assess your students during the inquiry, including a culminating activity. How will you get the students to present the results of their inquiry and answers to the “big” question? This step is the key to getting students to act like social scientists. That is they need to create reports or presentations (of course based on facts found in the primary sources). Student assessment, including the culminating activity, could include any of the following:
- Create a soil profile card.
- KWL (Know, want to know and what you want to learn) about soil
- Solve murder mystery case by identifying soils. The students use detective note sheets and discuss what they have found out.
- The students will keep a portfolio with all the evidence they have collected from the research they did in class to help in their discussion.
- The students will have to present a topic picked in class to elaborate on. The students will be placed in small groups of 3-5 to research the topic they have chosen to present about. The presentations will be about 3-5 minutes and the students will answer the topic question they were given.
During the presentations students will be asked to take a couple notes on the groups and write down any questions that they might have. They will hand in the questions at the end of the class period and the teacher will give them to the group that presented. This group will then have a chance to research the questions and to find answers to the questions.

There are two options of answering the questions depending on how the first round of presentations goes.

A. Before each group presents again the teacher will give back the questions students had and the student will then have the chance to ask their question and then the other group can answer it intelligently.

B. The teacher will lead the class in a discussion in which the questions asked will be answered.

The students will hand in their portfolios and write a short reflection on what they learned about how soil is important to our life.

**Step 6:** Develop the lessons that are based on providing the students with the resources that they can research the sub-questions (to understand the facts, concept, and generalizations) that enable your students to answer the “big” question using a Culminating project.

**Lesson 1:** (about 2 45 min class periods)

Lecture about soil profiles and the horizon layers. Then have the students create their own soil profile.

Print the soil profile cards onto cardstock paper or draw your own design on a 3" x 5" note card. Cut the cards apart. Attach a short strip of carpet tape to the card. Rolls of double-sided tape come in various widths. One-inch tape is adequate. Pull back the tape at the top to expose some of the sticky tape and place soil from the surface horizon to represent the depth of this soil. Pull back the tape for each additional layer one at a time following the same procedure. Properly dispose of the remaining tape piece. The card can now be placed in an envelope to protect it. You might also collect a little surface vegetation to keep with your soil type for learning about plant-soil relations.

**Lesson 2:** (1 or 2 45 min lessons)

The purpose of this lesson is to make students aware of the importance of soil. They will learn about some different types of soils.

- Students will gain knowledge of different types of soil texture.
- Students will gain a basic knowledge of soil and water holding capacity.
- Students will learn about soil horizons.
- Students will recognize different types of soils.
Students will be able to determine which soils are best for grasses.

1. Go over basic soil terminology that follows:

1. Loam: Uniform mixture of sand, silt, and clay that may feel gritty but does not have visible sand grains. The water holding capacity of loam is less than clay but more than sand. It allows plants to receive the water necessary for the growth.
2. Sand: Visible grains. A sample when wet and squeezed in the hand will not fall apart when hand is open. Poor water holding capacity. Water drains quickly through sand.
3. Silt: No visible sand grains. Very smooth and floury feeling (slimy), not sticky. Silt's water holding capacity is comparable to clay.
4. Clay: Sticky feeling and may be greasy in appearance. Will make a very tight ball that can be rolled out. Water holding capacity is great, but it may hold the water so tight that it will not release it for plants.
5. Soil Profile: A vertical section of the different layers which make up the soil structure from the surface to the parent material.
6. Soil Triangle: A visual representation of the three basic components of soil and how they can be mixed together to form different textures.

2. KWL: Start by finding out what the students know about soil.

3. Introduce the soil triangle. Discuss the types of soils: Clay, Silt, and Sand. Remember that the mixture of the three make loam which is what we use in gardens for example.
4. After completing the discussion of soil types have the students go to soil samples to see if they can distinguish the types of soils through texturing.
5. When they are finished texturing ask the students how the things we use in our life would be affected by the different soils and which type would be the best for growing, building and other things.

Lesson 3: (3-5 45 min lessons)

This lesson is a follow-up lesson from the soil profile lesson in which the students observed and recorded the three different types of soil. The students will use this previous knowledge to make logical guesses about where each soil sample was taken from.

1. Given different soil samples, the students will be able to observe and record the different characteristics and make logical guesses of where each soil is taken from.
   (Either a field, construction site, a lake, woods, and a driveway.)
2. The students will use the observations and information about the soil samples, which was collected from their group discussion, and the picture of Jack Hanson's boot, to make an inference as to where Joe Frisbee's body is located.

   Students work in groups of 3 or 4. They present their findings individually or as a group. Work area- students remain at their assigned seats. Special needs students may need extra attention with the instructions which may be given individually if needed.
Explain to the children that there is a problem and the students have to be detectives to help solve the problem. Tell them that there has been a murder! Joe Frisbee, a rich millionaire inventor of the Frisbee has been killed and it is the students’ job to collect data. Show them the drawing of the estate and explain to them that the police found Jack Hanson's shoe on the estate with several soil samples on it (prep this before and get samples of soils). Somehow the samples have been wiped clean from the shoe. The police took soil samples from around the estate but forgot to label them.

**Exploration Phase:**

It is the students’ job to actively observe the five different types of soil and decide which soil goes to what part of the estate. The students work together in their groups, discussing possible solutions and stating their evidence for their findings. In this phase, the students will record their findings on the worksheet labeled detective notes.

**Concept Introduction:**

Using the overhead projector, the transparencies and the estate map, the teacher records the students’ ideas about each soil. Possible questions:

1. Who has a guess about where soil A is taken from? Where do you think?

2. What characteristics have you found about soil A that makes you guess that is where it is taken from?

3. Could the soil have been taken from somewhere else? Anyone have any other possible ideas?

4. What do we notice that is similar about Soil C and D? (both are dark soil) What are different about the two soils? (one has leaves, twigs, acorns etc. other doesn't) What can this tell us?

5. Soil E is rather different than any other soil. Who can tell me what type of soil this is? Hint: We looked at this soil in class.

If the students disagree with an answer the teacher tells them, they have to find information to prove their findings. If a student gives an answer without appropriate evidence, the teacher tells the student that it will be thrown out of court and the students’ ideas will not be able to help solve the case.

**Concept Application Phase:**

Once the students have identified the soil types, the teacher poses a new problem for the students to solve. They look at the picture of the boot and decide which soil sample goes with which layer on Jack Hanson's boot. The teacher gives a description of each layer of soil because the drawing is hard to read.

She asks them for example:
1. The first layer on the boot has medium size rocks and parts of plastic in it. What possible soil sample could this be? Why do you think so?

2. The next layer has big chunks of a light brown material so where could this sample be from and why?

The teacher does this for each layer.

Then they look at the footprints the teacher has drawn onto the map and discuss possible solutions to where Joe Frisbee's body is buried. The students can take turns coming up to the enlarged picture of the estate and discussing possible solutions in their groups. After the discussion, each group should agree on one possible solution. This means that there will be a great deal of problem solving and debating skills used.

**Assessment:**

Teacher observations- Are students participating in discussion? Are they making logical guesses based on information found?

Detective Notes sheet- Are the students responses logical and sufficient evidence given for their findings? Did the students discover the correct soil samples?

**Lesson 4:** (6-8 45 min lessons)

Students will be placed in groups of 3-5 and they will get to pick a topic from the list of questions above in step 3. The first day will be to go over the project and to answer as many questions as possible.

The students will then have 2-3 days in a computer lab to help them come up with an answer to the big question. They will research their topic question.

Students will present for two days.

After presentations are done the students will get their list of questions from classmates and will get 1-2 more days in the library or computer lab to help answer them.

Students will then have a class discussion or more presentations based on the questions that the students had.