Lesson Plan for Soil Texture

Target Audience: 4th graders from schools across Northeast Nebraska. Most will not have general farm knowledge.

Venue and considerations: Wayne County Fairgrounds. no electricity or water provided. 1 - 6' table provided. 15 minute sessions.

General Subject Area: Soils

Instructional Unit: Soil Water

Instructional Area: Flooded soil problems

Contextual statement: How do flooded soils affect crops?

Objectives:

1. Students will be able to define infiltration and pore space.
2. Given a bucket of soil, students will be able to determine general soil texture (sand, loam, or clay) and soil water content by feel.
3. Given a bucket of soil, students will be able to predict how fast water will infiltrate the soil based on the texture.

Number of participants: 20 students per 15 minute session

Supplies needed:

- Buckets of sand *(wet and dry)*
- Buckets of clay *(wet and dry)*
- Buckets of silt loam *(wet and dry)*
- Artist (natural) sponges
- Soil Triangle
- Display showing pore space and different textures
- Sponges with various pore sizes
- Water/Tea
- Cookie cooling rack (or equivalent)
- Clear plastic pans/trays
- Measuring cups
- Baby bottle with tip of nipple cut off
- Funnel
- Test tubes or equivalent

Plan for the class:

What's going on	Supplemental Materials / supplies	How and why?	Timeline
Distribute containers of various soils for students to touch and feel. Q: What does soil do on the farm? A: Provide nutrients and water for crops. Q: What happens when it doesn't rain for a long time? A: Plants wilt or die. *One may choose to show wilted and non-wilted plants – I suggest peace lilies.* Q: So when you water a plant or it rains on a field, where does the water go? A: Water either runs off the soil or it goes down into the soil. We call this INFILTRATION. Q: What big weather event happened this spring relates to soil and water? A: The flood. Q: Did the water infiltrate or run off? A: Mostly ran off, but some areas are slowly infiltrating.	• Various soils • containers	Discussion with kids to make sure they understand the reason why water is needed for crops.	1 minutes
Discussion of soil types and pore space Q: How does water get into the soil? A: Water moves into the soil through holes called PORES. *(pass around artist sponges)*. The sponges we are passing around are kind of like big chunks of soil. They are full of PORES of all different sizes and no two are exactly the same. In soil, the size of the PORES depends a lot on what type of particles the soil is made of. Q: When you felt the soils at the beginning, did they all feel the same? A: No. Soils are made up of three different kinds of particles; sand, silt, and clay. The combination of these particles are what gives soil a different feel. *Show the soil triangle*. This triangle shows the different combinations of these particles and what type of soil they make. *Add "sand" to display board*. Sand is the largest particle. A single grain of sand can be seen by your own eyes. *Add "silt" to the display board*. Silt is the middle sized particle and must been seen through a microscope. It is very smooth. *Add "clay" to the display board*. Clay is the smallest type of particle. A very high-powered microscope is needed to see a single particle. Clay is what makes some soils sticky. *Add "loam" to the display board.* LOAM is a word that we use to describe a soil that has all three particle types. Sand, silt, and clay.	• Artists sponges • Soil triangle • Soil textures display	Passing around sponges. Kids can actually touch and see the sponges and their pores. This helps them to understand what soils may look like.	5 minutes

Hold up demonstration sponges. Q: How are these similar to the sponges that we just passed around? A: The space between the particles is like the holes in the sponges. These are the PORES of the soil. That's where the water goes, so where there are bigger PORES in the soil, the water should go through the soil faster. Demonstration of infiltration through the 3 "soil" types. Q: *Show 3 types of sponges.* Which one of these do you think is the most like sand? Which is the most like clay? Which one is more like a loam? A: Scouring pad is like sand. Foam is like clay. Sponge is like a loam. Q: *Pour water on "sand".* What happens when you pour water on the sand? A: Water runs right through because there are large PORES. The PORES allow for faster INFILTRATION. Q: *Pour water on "clay".* What happens when you pour water on the clay? A: It runs off the side of the sponge. That is because the PORES are so small, it is hard for the water to INFILTRATE, so instead it runs off or pools on top, which causes other problems on the farm. Q: *Pour water through "loam".* What happens when you pour water on the loam? A: Water eventually runs through because there are larger PORES than the clay, but smaller PORES than the sand. Q: What soil is better for plants? A: Loam. Q: Why? A: Because it has a mix of pore sizes so the water doesn't run right through and it doesn't pool on the top or run off as easily.	• Sponges • Colored water • Tray to pour water through/into • Baby bottle with tip cut off nipple • Measuring cups (to pour 1 cup on each "soil")	Instructor led demonstration that shows infiltration through 3 different sponges. The sponges represent the different types of soils and how they might react to the water. This makes an abstract concept like the pores in the artist sponges and allows the kids to visualize where the water actually goes.	5 minutes
Q: Did all the water run through the soils? A: No. Q: Is it better for the water go through or stay in the soil? A: Stay in the soil. If it goes through, it's not available to the plant. Q: Which one has the most water in it? Let's find out A: *Allow water to drain from each "soil" and squeeze over top of different test tubes/graduated cylinders (through funnel).* The water in each sponge indicates the amount of rain that INFILTRATED the soil and is available to the plant. Different soils can hold different amounts of water depending on the PORE space that they have.	• Test tubes • Funnel • Wet sponges from previous demonstration	Instructor led presentation shows how much water is still in the soil after infiltration or runoff.	2 minutes
Q: What does soil do on the farm? Q: Where does the water go when it rains, using our new terms? Q: What type of soil has the most PORE space?		Instructor led discussion to recap what was learned.	1 minute