What makes up good soil for growing plants?

MY OWN FOOD CHAIN PROGRAM (K-2)

Studying Soils
(ILS 7A, 12A, 12B)

Overview

This curriculum explores the relationship between people and the food they eat. It aims to give children in grades K-2 a basic understanding of the flow of energy through the food chain, and the place of people in the food chain. If teachers complete the entire curriculum, their classes will explore food chains in nature, focusing on its individual links and looking at the flow of energy as a whole. Students will then look at the place of people in the food chain, and discover how people have appropriated nature's systems in agricultural practices – making the food chain our own. Classes will compare traditional and sustainable agricultural practices.

Sustainable Agriculture, for the purpose of this curriculum, shall be defined as "a system of food production, supported by consumers, where farming operations, practices and technologies work in harmony with the natural systems that sustain life on earth."

Suggested Grade Level

This curriculum is designed for kindergarten through second grade levels. The topics covered can be built upon in complexity throughout that age range.

Approximate Time

Session one requires approximately 60 minutes; session 2 about 45 minutes.

Objectives

1. The students will use adjectives to describe different types of soil, and look for the different ingredients in soil samples they collect.
2. The students will compare and contrast different types of soil and complete "ingredient lists."
3. The students will try to grow different plants in different soils and see which soils work best.
4. The students will create their own ideal soil based on their observations.

Activity Abstract

In session one, the students will study various types of soil and compare the "ingredients" that make up soils from various places. In session 2, the students will create their own soil based on observations from session 1.

Background Information

Soil is the very thin layer over the surface of the earth. Illinois garden soil is made up of approximately – 45% rock particles (sand, clay, silt), 5% organic matter, 25% water, and

25% air. Soil particles usually consist of minerals (inorganic compounds of two or more elements). The different soil types are determined by their texture – the different amounts of sand, clay, and silt that are in the mix. Sand, silt, and clay are different particle sizes, created by weathering rocks (process in which rock is broken down into smaller particles. There are two types of weathering, chemical and physical (water, air, pressure). A soil's drainage and nutrient holding capacity can also be determined by its particle size. Changing texture can help make the right conditions for certain plants to grow.

	Size diameter (mm)
• Sand – the largest particle in the soil	0.02-2
• Silt – middle	0.02-0.002
• clay – smallest particle	<0.002

Materials

- Cup of pond soil
- Cup of playground soil
- Trowels
- Buckets
- Paper plates to examine soil on (several per student)
- Hand lenses (1 per student)
- Sharpie®
- Disposable cups or cheap, small plant pots
- Several types of seeds, (2 per student per seed type)
- Potting Soil (of the Home Depot type)
- Soil samples from places that you might want to use but know you can't get to, such as a farm.
- Soil recipe cards, see appendix
- Soil ingredients (sand, leaves, sticks, rocks, etc., as determined by students)
- Measuring cups (1/2 cup; 1 per pair)
- Large mixing spoons (1 per pair)
- Bowls (4 cup capacity; 1 per pair)

Procedure (Session 1)

1. Introduce lesson and **tap prior knowledge.** Ask students what they've already done in their rocks and soil unit to get an idea of what they already understand.
2. Explain that soil is like a cake. Has any one ever baked a cake? What do did you do? Like making a cake, soil has "ingredients" – and different types of soil have different amounts of different types of ingredients that go into making the soil.
3. Explain that we're going to look at the ingredients of soil in different places. Ask students to think about standing at the edge of a pond, with their feet just a little bit in the water. Pass around a cup of pond soil for the kids to see, feel, smell. Describe the soil using describing words (such as mucky, slimy, sticky, brown).
4. Now imagine you're standing on the playground outside school. Pass around a cup of playground soil. List describing words about this soil (hard, gray, dusty, etc.)

5. Explain that the words are different because the ingredients in the soils are different in those places. We want to make a list of places where we might go to collect different types of soil. We can start the list with those two – pond edge and playground. Have students list other places, and help them if they need it. Lists may include: prairie, woods, farm field (traditional), farm field (organic), store-bought potting soil, marsh/swamp, garden, yard, etc.
6. **Hands-on experience.** Go out to collect soil samples. Split class into groups (based on adults present) and have each group be in charge of carrying a bucket and a trowel. Collect soil (half a bucket full or so) from three or four good places chosen from the list. Bring along any soil samples that you know are too far away to collect as a class.
7. Go inside to complete the comparisons.
8. Have each student work with a partner. Give each student a hand lens and each pair of students a plate with soil on it (it helps to label paper plates telling where the sample came from). Have students study the soil to try and determine which ingredients make it up and what there's the most of, least of, etc. Have them make lists (with adult help for younger students).
9. Have each pair of students look at two different soils samples. They can do more if time permits.
10. **Introduce scientific principle.** Compare some of the soils on the board. What's the same and different about them?
11. Go over some of the ingredients if needed (clay vs. sand vs. rocks, etc.)
12. Explain that if soil is like a cake, then the plants that grow there are like the frosting. We are going to grow some frosting in our different soil cakes and see which soils make better frosting.
13. Ask, do all plants grow in the same type of soil? (No.) So how well our plants grow in soil will partly be because of what type of plant it is. We're going to plant_____.
14. Have each student pair plant two seeds (one per person) per cup. Each pair should plant two cups, using the soil that they analyzed. Follow planting instructions on seed package. Make sure that all plants are watered on the same schedule and have the same exposure to light.
15. Grow plants for several weeks. Make observations as you go. Record measurements of the growth each week to compare and note changes.

Procedure (Session 2)

1. Note which soils grew plants the best from session 1.
2. Review the ingredient lists from those soils that you generated in session 1.
3. **Hands-on experience.** Explain that now that students have had a chance to observe which soil cakes grow the best frosting, they're going to try to make their own soil cake. Pass out recipe cards (partners).
4. Go over instructions… all soil has air and water, so those are filled in on the cards. The water will be added gradually as you water the plants.
5. The students get to choose 6 other half cups of ingredients. They can use more than one of something and they don't have to use all the choices. Demonstrate how to measure and fill in recipe card.

6. FINDING INGREDIENTS IS OPTIONAL. You can have students collect certain ingredients, like leaves or sand; or you can buy them all at the hardware store. If the students are finding them, go out and do it now. If not, go on to…
7. Set up ingredients in stations around the room.
8. Allow students to make soil.
9. Mix soil well.
10. Plant seeds in soil.
11. Have students predict how fast the plants will grow in their soil.
12. Grow, monitor, record measurements of growth, etc.
13. **Conclusion/Wrap-up.** Compare recipes and success rates after several weeks.
14. What ingredients could have made the differences between the growth rates? What else should have been added or subtracted from the recipes?

References

"Soil Bake-off" workshop from the Chicago Academy of Sciences' Peggy Notebaert Nature Museum.

Appendix A: Soil recipe card.

Our Soil Recipe

Names_____

_____

Ingredients:

1 cup AIR
1 cup WATER

½ cup_____

½ cup_____

½ cup_____

½ cup_____

½ cup_____

½ cup _____