S-O-I-L Soil

Summary

At the end of this activity students should know that plants need nutrients to grow, those nutrients come from the soil, and nutrients can be added to soil to help plants grow better.

Materials

Farmer costume
Scientist lab coat
Bucket of soil
Old MacDonald song overhead
Soil journals
Sample of fertile soil, organic rich
Sample of infertile soil, poor nutrients
Small wilted plant
White butcher paper
Magnifying glasses
Crayons / colored pencils
12 x 18 white art paper
Fine point markers

- Old MacDonald's Script (pdf)

SOIL

Additional Resources

Books

- *McBroom Tells the Truth*
  , by Sid Fleischman; ISBN 0843179437
- *McBroom's Wonderful One Acre Farm*
  , by Sid Fleischman; ISBN 0688155952

Background for Teachers

Prior to teaching this lesson your students need to have basic knowledge of the components of soil. You will also need to enlist a student or another teacher to help you with your invitation to learn.
At the end of this activity students should know these things:

Plants need nutrients to grow.
Plants get those nutrients from the soil.
Nutrients can be added to soil to help plants grow better.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn

Teacher dresses up as Old MacDonald. (Overalls, straw hat, shovel) Comes in classroom carrying a small, wilted plant.
Old MacDonald: (Acting sad and discouraged) I am just not having any luck growing crops on my farm and I'm very worried about my farm and my animals! If I can't grow hay, my cow will get skinny and not give milk. If I can't grow corn there'll be no food for my chickens and they won't lay eggs and

my pigs won't grow big and fat and there'll be no bacon to eat for breakfast! Even my poor old horse will get too tired to take me for a ride if I can't grow oats. Something is wrong with my farm, but I just don't know how to fix it--I must be a bad farmer!
Student or another teacher dressed as a scientist in a lab coat enters the room carrying a bucket of soil.
Scientist: " Old MacDonald I think I know what your problem is..... you're not a bad farmer...it's your soil!"
Old MacDonald: "My soil? (Looks in bucket) That's just plain old dirt! What's dirt got to do with not being able to grow crops for my animals to eat?"
Scientist: "What's dirt got to do with it? Just everything Old MacDonald!"
(In an aside whisper to students: "Maybe he is a bad farmer if he doesn't even know that--lucky we came along to help him!")
Lucky for you, I'm a soil scientist and I've got all these great assistant scientists to help you out. We'll dig (ha-ha) until we find out what the problem with your farm is, don't you worry! And to cheer you up and help you understand what soil has to do with your crops we'll sing you a song! Okay, assistants you know this song...help me sing it so we can get started on helping Old MacDonald fix this farm."
Song (to the tune of Old MacDonald Had a Farm)
Old MacDonald had a farm
S-O-I-L SOIL
And on his farm he had some crops
S-O-I-L SOIL
With some shriveled corn here and a skinny cow there
Here no crops, there no crops
Your soil's why there's no crops
Old MacDonald had a farm
S-O-I-L SOIL
Scientist: "Are you ready assistants? We're going to fix this soil and help Old MacDonald have the best farm in Utah!"
Old MacDonald: "Yippee! Let's get going!"
Instructional Procedures

Make Soil Journals (It would be best to have these made ahead of time)

Access students' prior knowledge about what plants need to grow. Draw a plant on the board or on a poster showing what plants need. Patterns for students to trace to make their flowers are included in *Soil Journal* blacklines. Have students copy this information onto the flower. Each section goes on a different petal. When done they can insert the flower into the cover of their Soil Journal.

Plants need:

Sunlight: They need to be planted where they can get the amount of sunlight they need. Some plants like shade and some like full sun.

Water: Plants get water through their roots. If they have too much or too little water they will not grow well.

Air: Soil needs to be loose and have air pockets in it for the plants. If the soil is too wet or too tightly packed there is not enough air.

Nutrients: Plants need certain foods called nutrients to grow and be healthy just like you do. These nutrients come mainly from decaying organic (plant and animal) materials in the soil.

Ask this question: What does soil have to do with plant growth? Listen to this excerpt from a tall tale about a farmer named McBroom who bought a wonderful one-acre farm. See if you can figure out what the soil on his farm had to do with the way his crops grew.

Read this excerpt from *McBroom Tells the Truth* by Sid Fleischman

But the moment I ran the topsoil through my fingers, my farmer's heart skipped a beat. That pond bottom felt as soft and rich as black silk. "My dear Melissa!" I called. "Come look! This topsoil is so rich it ought to be kept in a bank."

I was in a sudden fever of excitement. That glorious topsoil seemed to cry out for seed. My dear Melissa had a sack of dried beans along, and I sent Will and Chester to fetch it. I saw no need to bother plowing the field. I directed Polly to draw a straight furrow with a stick and Tim to follow her, poking holes in the ground. Then I came along. I dropped a bean in each hole and stamped on it with my heel.

Well, I had hardly gone a couple of yards when something green and leafy tangled my foot. I looked behind me. There was a beanstalk traveling along in a hurry and looking for a pole to climb on.

"Glory be! " I exclaimed. That soil was rich! The stalks were spreading out all over. I had to rush along to keep ahead of them.

By the time I got to the end of the furrow the first stalks had blossomed, and the pods had formed, and they were ready for picking.

You can imagine our excitement. Will's ears wiggled. Jill's eye's crossed. Chester's nose twitched. Hester's arms flapped. Peter's missing front teeth whistled. And Tom stood on his head.

"Willjillhesterchesterpeterpollytimtommarylarryand littleclarinda," I shouted. "Harvest them beans!"

Within an hour we had planted and harvested that entire crop of beans. But it was hot working in the sun! I sent Larry to find a good acorn along the road. We planted it, but it didn't grow near as fast as I had expected. We had to wait an entire three hours for a shade tree.

Of course, there was a secret to that topsoil. A government man came out and made study of the matter. He said there had once been a huge lake in that part of Iowa. It had taken thousands of years to shrink up to our pond, as you can imagine. The lake fish must have been packed in worse than sardines. There's nothing like fish to put nitrogen in the soil. That's a scientific fact. Nitrogen makes things grow to beat all.

Tell the class: This story gave us some good clues about what needs to be in soil for plants to grow. We are going to study two soil samples. One sample is rich, fertile soil...this would be the kind of soil on McBroom's farm where the crops grew very well. The other will be poor, infertile soil, like the kind on Old MacDonald's farm where the crops are not growing well at all.

Discuss the adjectives "rich" and "poor" used to describe soil-- why do you think these are good descriptions of soil?

Our job will be to examine these soil samples and figure out what the difference is between rich fertile soil and poor infertile soil.

Put class into groups. Have them put their desks into tables and then cover the desks with white butcher paper or large white art paper. Give each group two soil samples--label the Fertile Soil "McBroom's Farm" and the infertile soil "Old MacDonald's Farm". They will need their crayons or colored pencils and their Soil Journals.

Instruct students to carefully spread out their two soil samples-- making sure not to mix the two samples. Closely examine and compare the two soils, use the magnifying glasses. Look at the color and the composition of the soil. Does it look like there would be air in the soil? How much water is in the soil? What texture is the soil?

Separate the living and once-living organic materials from the non-living inorganic materials. You could have students draw a graphic organizer such as a word web to help them organize the different components.

In their Soil Journals they need to do a Compare/Contrast rectangular Venn diagram.

McBroom's Rich Fertile Soil	Things that are alike	Old MacDonald's Poor Infertile Soil

Things that are Different	about the two soils	Things that are Different

They need to look for things that are similar between the soils and things that are different. Use words and pictures to complete the diagram.

Each group needs to come up with a hypothesis about what differences in the soil affected the plant growth. They need to use words like fertile, infertile, nutrients, and organic in their hypothesis. Have each group choose a scribe or secretary to write down their ideas. Give them a large 12 x 18 paper and markers to write with so the others can see it to copy it into their journals after the groups are satisfied that they have correct final version of their hypotheses.

Example: The fertile soil from McBroom's farm had lots of organic material in it. There were decaying plants and even a worm. We think the organic matter provided the nutrients that the plants needed to grow better. The soil had enough air in it for the plants to live and the right amount of water.

The infertile soil from Old MacDonald's farm was very (sandy, dry, loose) or (heavy, wet, sticky, hard) so it did not have the right amounts of air and water. There was hardly any organic matter in it, so there weren't enough nutrients for the plants to grow.

On the next page in their journals they need to illustrate the two farms, showing the type of soil and the way plants would grow. Label the first drawing "McBroom's Fertile Farm". Label the second drawing "Old MacDonald's Infertile Farm".

Discuss with class:

Can we help Old MacDonald with his problem?

Can he improve the soil on his farm so his crops will grow better?

What are some things you think would help?

Tell class that you have a Readers' Theater that will help them learn about things they can do to help improve soil so it can grow crops better. When you finish the *Reader's Theater* have a class discussion and talk about what they learned about soil from doing the play.

Extensions

Struggling readers: Give them a copy of the *Reader's Theater* in advance and have them practice their parts.

Have students make props and figure out actions/movements to add to *Reader's Theater*.

Ask students to get a soil sample from their yards and bring to school to analyze.

Invite an expert gardener to come to your class and talk about what they do with their soil.

Go on a mini field trip to visit a neighborhood garden or farm.

Family Connections

Encourage students to discuss plans with their families to allow child to have a small garden plot or flower garden. Have student teach family what they can do to make the soil fertile.

Assessment Plan

Formative: Teacher observation as they come up with hypotheses about soil.

Evaluation of their journal pages

Final Assessment: S-O-I-L Soil pdf

Read situation cards with multiple-choice answers to class. Have them write their answers on an answer sheet.

Example:

The flowers in Bob's garden are dying. The roots and stems are all waterlogged. What does he need to do?
A. Mix more clay in with the soil
B. Mix more sand in with the soil
C. Water the flowers more
D. Add fertilizer

Bibliography

Research Basis

Dickinson, V.L, Young, T.A. (1998) *Elementary Science and language arts: Should we blur the boundaries?* Retrieved 1/4/2007 from http://www.education.ky.gov/KDE/

Helping teachers see, understand, and implement instructional practices which rely on teachers' strengths in language arts instruction to improve their teaching of science content could be a solution to the lack of confidence in science instruction.

Nixon, D.T. Akerson, V. L. (2002) *Building Bridges: Using Science as a Tool to Teach Reading and Writing*. Retrieved 1/4/2007 from http://www.education.ky.gov/KDE/

This study cited many previous studies that proved the value of integrating science and language arts. There are many reasons to consider the integration of science and language arts. The most compelling is evidence showing cognitive parallels. Reading, writing, and science all require a combination of cognitive processes and the activation of conceptual knowledge. The strategies that are applicable to reading and writing are comparable with the strategies used to construct science understanding.

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