DIY Soil Builder

Background:
Without life, soil would be crushed rock. A soil builder terrarium will provide your school garden or classroom with an inspirational tool that can be used for many different lessons, while providing a year-long opportunity for creative, hands-on learning.

*Grades:* 2nd through 4th (lessons can easily be adapted to other grade levels)

*Time:* One to two hours to assemble the tank with the class

*Materials:* One five-gallon tank with screen top, gravel, garden row cover, tulle, glue, sand, soil, leaf litter, soil organisms, small hand rake. Note that tanks should be assembled in place as they are heavy once filled with soil.

Terrarium Assembly:
At the beginning of the school year, assemble the terrarium with your class, using materials from the school garden. First, put in an inch of fine gravel, level it, and place a piece of row cover, cut to the size of the tank, over the gravel. This provides drainage and allows you to see if the tank is being overwatered. Carefully add about 3 inches of ordinary soil (*not* improved garden soil) into the tank and level it. This will be easiest to do if the soil is damp, but crumbly. Add about an inch of dry river sand (do not use beach sand, as the salt content is toxic to soil organisms), level it, then follow with two more inches of soil and level again. Students can then add organisms that they find in soil, leaf litter and garden compost (beetles, millipedes, earthworms, pill bugs, etc.) It is important to add a few night crawlers, not only the red wiggler worms found in compost. Red wigglers stay in the interface between soil and organic matter, while night crawlers burrow into the deeper layers of soil. Finally, add a shallow layer of dry leaves and other organic material such as moss, and twigs. Water gently until the soil is damp but water has not accumulated in the bottom. Students may want to add additional organisms to the terrarium as they find them. If you are keeping the terrarium in a classroom, glue a piece of fine tulle (bridal veil fabric) to the underside of the screen to prevent tiny flies from escaping. Important: Save a sample of the ordinary soil to use for comparative purposes at the end of the school year.

*Care:* Check moisture levels and food weekly. Maintain moisture in the soil, but avoid standing water in the gravel at the bottom. With young students, watering may require direct supervision. Once a week, feed the terrarium by adding some green leaves, apple cores, banana peels and other compostable material (no meat or dairy). To add food, carefully pull back the layer of dry litter with the hand rake, add the food, and pull the dry litter over the top. Using the hand rake prevents students from being bitten or stung by organisms such as centipedes, potato bugs, spiders and beetles with large mandibles that they may have added to the terrarium.

More information on earthworms can be found here: [http://www.pacifichorticulture.org/garden-allies/70/1/](http://www.pacifichorticulture.org/garden-allies/70/1/)
Activities: Here are a few activities you can use to explore a variety of concepts, learn how the soil below our feet is formed, and have fun! We encourage teachers to be creative with this school-year-long activity; it offers rich possibilities for imaginative lessons. Students can be encouraged to develop their own activities and experiments. Let us know how you use the terrarium with your students; we are interested in developing lessons to use with this fascinating microcosm.

- Count the organisms. Look at the top and sides of the terrarium, and pull back the top layer of material to see what is in the first layer of soil. Research the organisms and discuss their characteristics and functions. Which are insects, arachnids, annelids and mollusks? Dig a little deeper, and examine the diversity of organisms you find there – are they different than in the top layer? If you want to dig into or below the sand layer, be careful to only dig in the middle, and not disturb the layer of sand where it touches the sides of the terrarium. Discuss the different locations in the terrarium where each species can be found, and what their appearance and location suggests about how they live. Do this a few times during each month, because new organisms will show up, even if you haven’t added any! Where did they come from?

- Divide the tank in half (a stick works well) and place two separate piles of materials on the top layer (one fresh compostable food scraps and the other straw, dry leaves and twigs, or use two items of your choosing) and monitor them every few days as they decompose. Discuss which materials break down faster, why they do so, and where they go. Discuss the role of decomposers in the soil food web, and in soil creation. Which organisms are in the tank that act as decomposers? How do they contribute to building soil? Discuss the role of organisms you may not see (e.g. bacteria)

- Cover one side of the terrarium with black paper. Worms will be more active in the dark. Over the course of the school year, the night crawlers will mix the sand with the soil. Each month, observe and discuss the differences between the side of the terrarium with the paper and the sides that get light. Discuss the role of earthworms and other decomposers in mixing soil and creating passages for air, water, and roots, and for other organisms.

- Generally, depending on the number of organisms in the terrarium, it takes about the length of a school year for the sand to be fairly well mixed into the soil. For a final project, the soil can be removed and compared to the original soil.

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