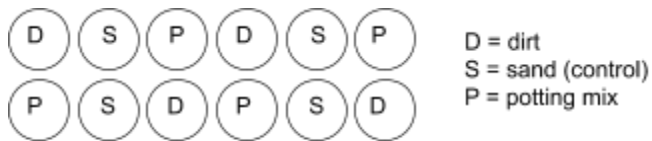


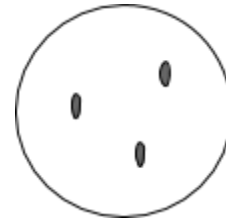
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|---|---------------------|--|
| Soils and Plants | | Grade 3 Understanding Earth and Space Systems: Soils in the Environment |
| Lesson Plan | Safety Notes | Check collected soils for unsafe objects before beginning and wash hands after investigations. |
| <p>Description</p> <p>Soil is an essential source of life and nutrients for many living things. Students examine the composition and characteristics of soils and set-up an experiment to see how well different soils support plant growth.</p> | | |
| <p>Materials</p> <ul style="list-style-type: none"> ● Lettuce seeds (1 pack) ● 1 cup each of sand, dirt, seed-starting potting mix or compost ● Egg carton ● Tray or dinner plate ● Permanent marker ● Tablespoon ● Saucer ● Toothpicks (2) ● Water in a spray bottle (1 cup) | | |
| <p>Science Background</p> <p>Soils are made up of living and non-living things and have qualities that make them good to grow plants. Non-living things include decomposed organic matter (from things that were once alive), minerals, water, and air. Living things include bacteria, fungi, worms, and insects. Not all soils are the same. Some have more minerals (rocks) - these are sandy or clay soils. Some have more decomposed organic matter and are called loam. Loam soils have more nutrients. You can buy specially prepared mixtures of soil, like seed-starting potting mix. These have lots of organic material and may have chemical fertilizers and additives like perlite, which is a volcanic glass that helps hold water in the soil. Plant roots need nutrients, water, and air for plants to grow.</p> <p>You can set-up an experiment to test how well different soils support plant growth. You need to have an experimental design. Experiments need to have treatments and a control (different soils) and replication (so you know the effect you are seeing is really because of the treatment).</p> | | |

Activity Procedure

Examine your soil samples and draw what you see on the worksheet. Think about which soil will support plant growth the best. Consider how it will provide air, water, and nutrients to the plant roots. Which soil do you think will support your seedlings the best? Write it down, this is your hypothesis. We can consider sand to be the control because it will have very little nutrients. Your egg carton has 12 cups and you have 3 treatments. If you divide 12 by 3 you get 4. So, you will have 4 replicates - that is good - you want at least 3. Here is a randomized block design you can use as you follow the steps listed below:



1. Label a side of the cone beside the egg-cup with the letter that corresponds to the treatment - use a permanent marker so it isn't washed away when you water your seeds.
2. Plant the seeds following the instructions on the package (~ 0.6 cm deep). You can mark the right depth on a toothpick and use that to make the holes for the seeds. It helps to pour the seeds on a saucer then use a wet toothpick to pick up the seeds and a dry one to brush them off into the hole. Plant three seeds in each cup because not all seeds will germinate.
3. Place the carton on a waterproof tray or dinner plate, and spray the seeds until the soil is soaked (just pour a bit of water if you don't have a spray bottle).
4. Place your experiment in a sunny window, water and observe it every day for a week. Do not let them dry out, but don't keep them too wet because plant roots need air too. Write your observations down on your worksheet. Once the seeds germinate you can thin them - that means you remove all but the best-looking seedling from each cup so you just have one per cup.

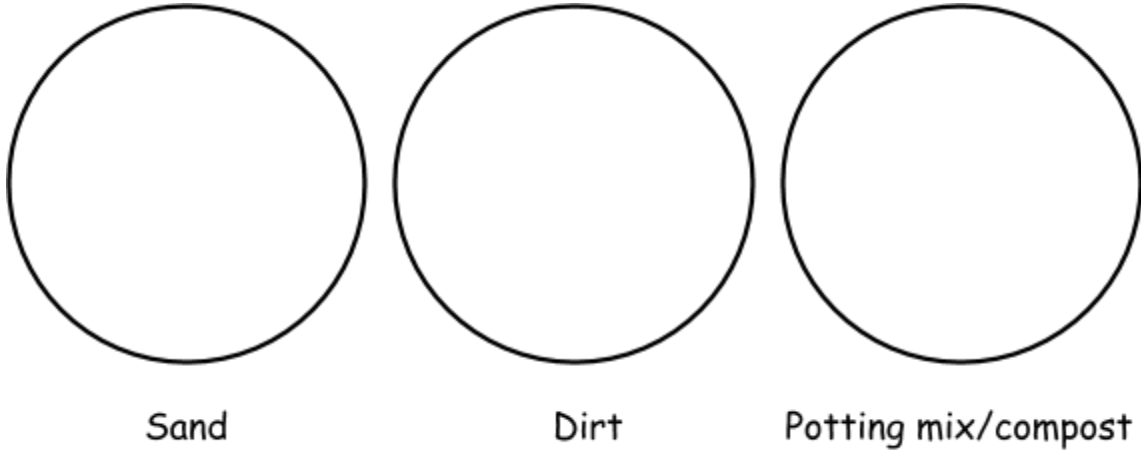


Debrief

What can you conclude from your observations? Do you think soil collected from outside might have had living things, like bacteria and fungi, that may have affected your results?

Handout

1. Draw a picture of each type of soil and add some labels (e.g. rock, root, perlite).



2. Based on your observation of the soils, which one do you think will grow the seeds best?

3. Record your observations of the seedlings (e.g. germination, leaves, height, colour).

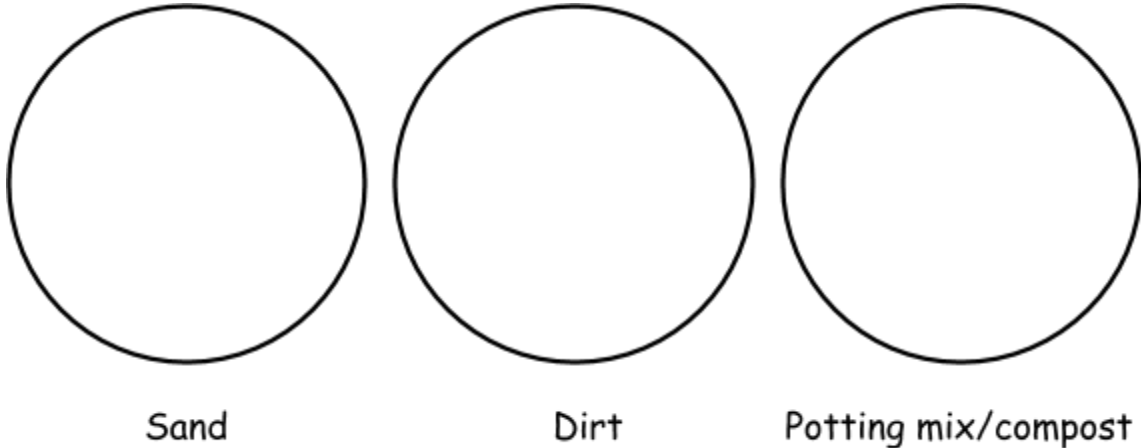
| Day | Sand | Dirt | Potting mix/compost |
|-----|------|------|---------------------|
| 1 | | | |
| 2 | | | |

| Day | Sand | Dirt | Potting mix/compost |
|-----|------|------|---------------------|
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |

4. What conclusions can you draw from your observations? Do you have any new questions based on these observations?

Handout

1. Draw a picture of each type of soil and add some labels (e.g. rock, root, perlite).



2. Based on your observation of the soils, which one do you think will grow the seeds best?

The potting mix has lots of organic matter, so it might grow the seeds best.

3. Record your observations of the seedlings (e.g. germination, leaves, height, colour).

| Day | Sand | Dirt | Potting mix/compost |
|-----|----------------|-----------------------------------|---------------------|
| 1 | No germination | One seed has started to germinate | No germination |
| 2 | No germination | Three seeds have germinated | No germination |

| Day | Sand | Dirt | Potting mix/compost |
|-----|---|--|---------------------------------|
| 3 | One seed has germinated, sand gets dry faster | Most seeds have germinated, dirt is staying damp | No germination |
| 4 | Shoots are smaller | Seedlings have two leaves | Seeds have started to germinate |
| 5 | Leaves are not as dark, seedlings are leaning towards the light | Seedlings are leaning towards the light | Most seeds have germinated |
| 6 | Seedlings have two leaves | Seedlings are larger than other treatments | Seedlings have two leaves |

4. What conclusions can you draw from your observations? Do you have any new questions based on these observations?

The dirt germinated the seeds the best. If the potting mix has more organic matter and nutrients, why didn't the seeds germinate as fast as in the dirt? Do the bacteria and fungi in the soil have an effect on germination and nutrient uptake?