



Building Blocks

A Demonstration of How Trees Grow

Purpose

In this activity, we will explore how trees get so big and where they get the materials to grow from.

Time

15 minutes

Materials

- LEGO, Duplo, Base Ten or other blocks of equal size in three colors
- Two pieces of paper or adhesive tape



Prompting Questions

Where do you think trees get the materials that they need to grow? A lot of people think trees use only soil to grow, but in that case, wouldn't the soil around large trees disappear as they get bigger?

Background

It turns out that trees get their mass from the air! Trees use carbon in the air for mass and energy through the process of photosynthesis. [Learn more about photosynthesis.](#) Trees take carbon dioxide from the air and water from the soil; they use the carbon to create glucose, and release the unused oxygen. Because of this, trees play an important role in the carbon cycle.

This activity presents a simplified demonstration of this process which leaves out the oxygen that is released as a byproduct. The advanced version below includes the oxygen.

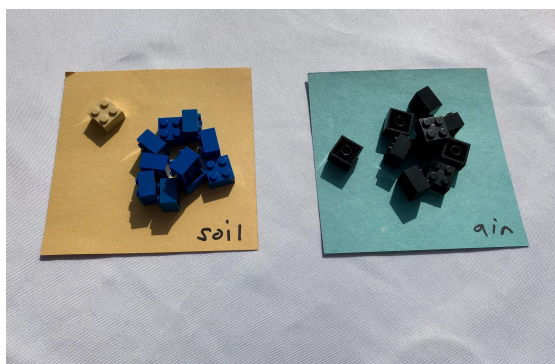
Set-up

Find a flat surface like a table or the floor and use your tape or paper to create a rectangle representing air and a rectangle representing soil.

The blocks represent water, carbon, and nutrients. Assign each material to a different color block. You should have about the same number of blocks representing carbon and water, and then significantly fewer blocks representing nutrients. For example, you may wish to use 10 carbon, 10 water, and 1 nutrient. Adapt this activity for different ages by using different sizes and quantities of blocks. For younger participants, consider using fewer/bigger blocks. For older participants, use more/smaller blocks.

Process

Now describe what you are doing as you place the blocks onto the surface.



Start with the nutrients. Trees need very small amounts of nutrients to grow. These nutrients are found in the soil. *Place nutrients in the rectangle representing soil.*

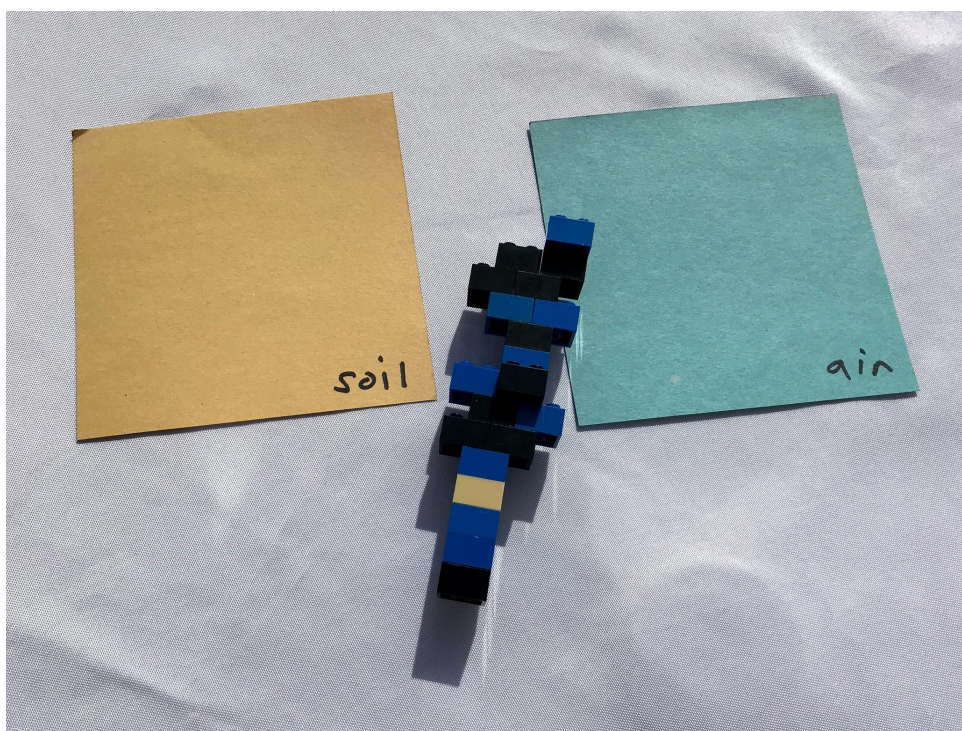
Water falls from the sky when it rains and soaks into the soil. Trees absorb the water through their roots. *Slide the blocks from the air rectangle into the soil rectangle.*

And finally we have carbon. Carbon gets released into the air in a variety of ways. When we breathe out, there is carbon in our breath. Carbon also comes from the exhaust from cars and factories. When something burns, it also releases carbon into the air. *Place carbon into the air rectangle.*

Now we're going to build our tree using all of the blocks on the table.

Circle back to the prompting questions. Now where do you think trees get the materials they need to grow from?

While trees use some nutrients from the soil to grow, most of a tree's mass comes from the air.



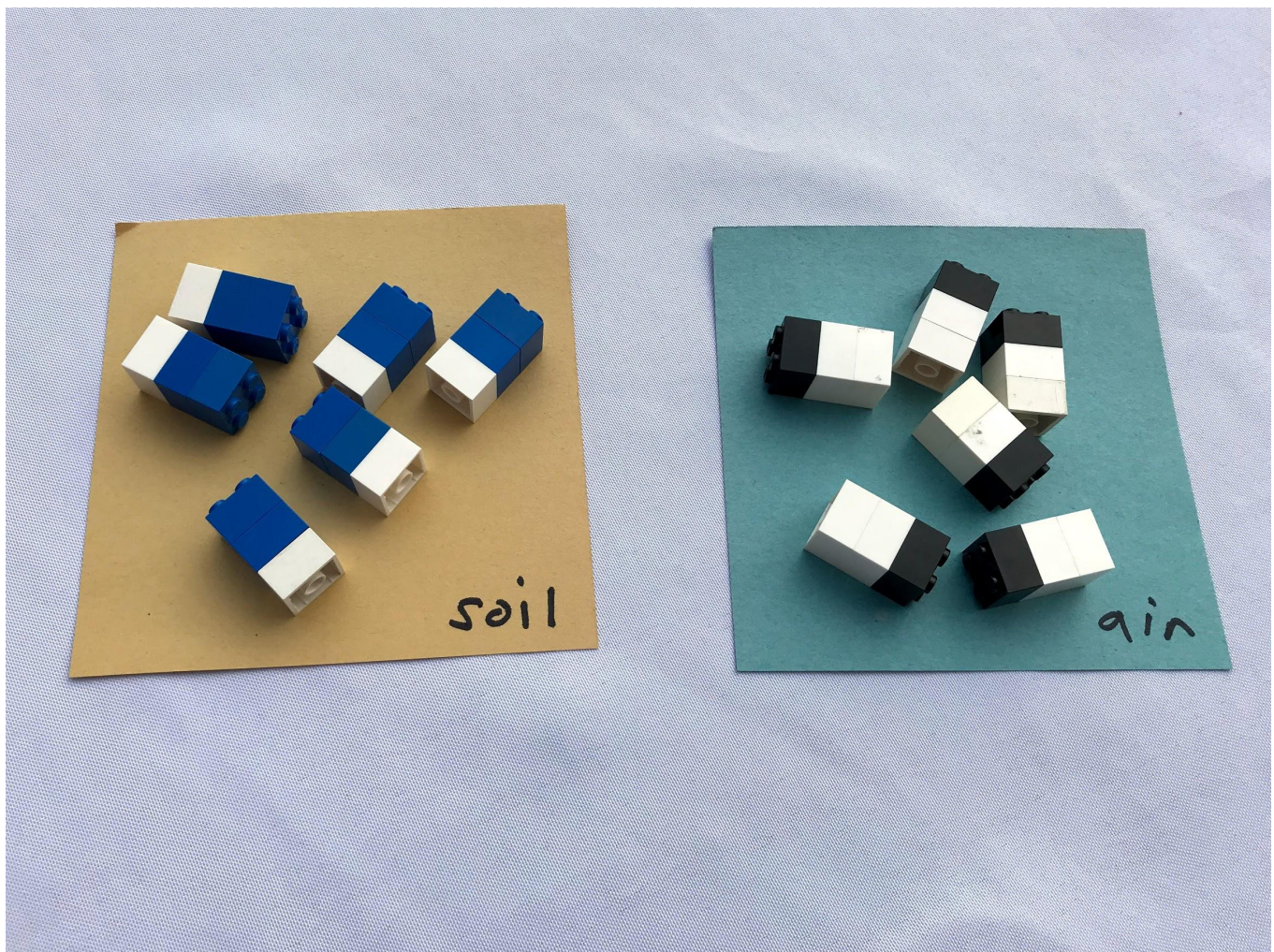
The two main ingredients are carbon, tiny particles that float through the air, and water, which falls from the sky when it rains. The soil provides a place for the tree to anchor itself, but doesn't contribute much to the mass of the tree.

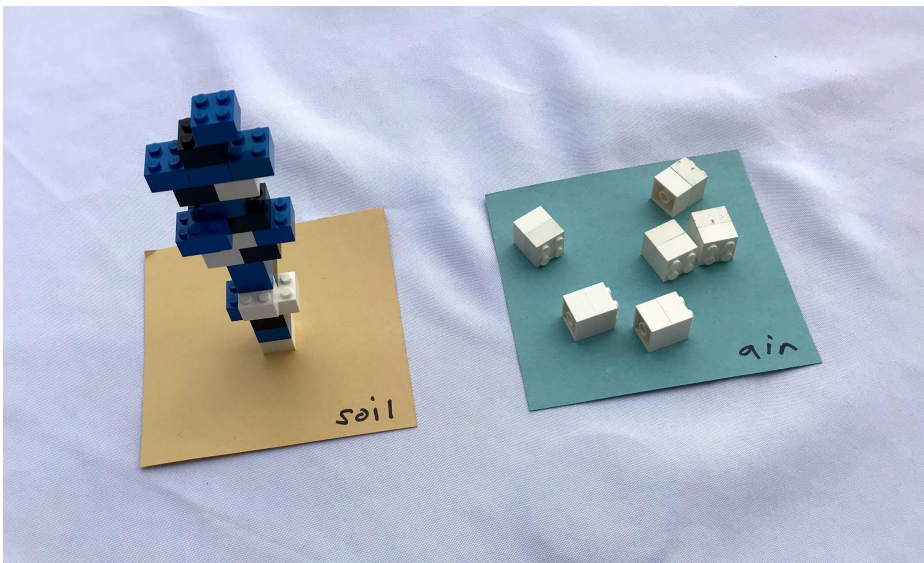
Advanced Version

For more advanced participants, you can adapt this activity to more closely mirror the process of photosynthesis. Blocks that can be attached, such as LEGO, will work best for this version.

This activity will demonstrate how trees use sunlight to convert carbon dioxide and water into sugar and oxygen.

In this version, the blocks represent oxygen, carbon, and hydrogen (more accurately, 6 atoms of each). Create carbon dioxide molecules using one carbon and two oxygen blocks. Now create water using two hydrogen and one oxygen. You will need to prepare your "molecules" in advance. The participant should take one carbon dioxide and one water and separate the blocks. The effort that you put into breaking the blocks apart represents the Sun's energy.





Now, they will remove two oxygen blocks. While they are important for us to breathe, the tree does not need these, so they are released into the atmosphere. The remaining blocks form glucose (sugar) which the tree uses for energy and mass. Now start building your tree with the remaining blocks.

Continue converting carbon dioxide and water into sugar and oxygen until you have enough blocks to build your tree.

Further Exploration

Do you think the size of a tree indicates how much carbon it is storing?

What do you think happens to the carbon when the tree (or part of the tree) dies?

Do you think there is more atmospheric carbon dioxide in the summer or winter?