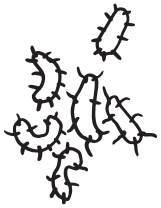
How healthy is the ?

SMART KIDS LAB
Step by Step

SMART KIDS LAB

How clean is the air you breathe? Is swimming water the same as drinking water? How many microbes live in the soil beneath your feet? And what does it all mean? DISCOVER how healthy your neighbourhood is and what you can do to improve it. SMART KIDS LAB lets you examine the water, noise, air, earth and light around you with homemade measuring instruments. On the smartkidslab.nl website, you'll find out how to make the measuring instruments (meters) and how you can GET STARTED.



HOW HEALTHY IS THE SOIL??

YOU'LL BE INVESTIGATING THE SOIL IN YOUR AREA. There are millions of microorganisms, tiny fungi and bacteria called MICROBES, in the ground beneath you. The more microbes there are, the HEALTHIER the soil is. And that's good for different types of plants! But soil is often unhealthy, for example, around new building sites where fertile ground has been dug up, or where too many pesticides have been used. When the soil is unhealthy, not much can grow.

HOW DOES IT WORK?

It all begins with the QUESTION: What do you want to measure? Do you already know? GREAT! Now you can GET GOING.

STEP 1.

You start by making the MEASURING INSTRUMENT. *What you'll need: Smart Kids Lab / making meters. There you'll find all the information you need to get started.

STEP 2.

Now it's time to go do RESEARCH and experiment. Before you start, think about what you want to investigate in your area and how to go about doing it.

For example, could you investigate how many MICROBES are in your backyard, your potted plants, or your sandbox? Microbes are so small that you can't see them with your eyes. But if you get a lot of microbes together, they'll create ELECTRIC CURRENTS. Electrical voltage is measured in Volts (V) and can be read with the voltmeter. This measurement will determine if there are a lot or just a few active microbes in the ground. TIP: Wait a day so that your microbes can get going. More volts means more active microbes in the ground. You'll find more facts in the Compare-o-Meter

*What you'll need: the Smart Kids Lab / experiments worksheet. This explains how to use your homemade meter to collect data.

STEP 3.

Collect the measurement DATA on the Smart Kids Lab worksheet. *What you'll need: the Smart Kids Lab / experiments worksheet. You can record your measurements here.

STEP 4.

Go grab the COMPARE-O-METER so you can compare your measurement data to that of others. You'll also find a lot of interesting information here. *For this you'll need: Smart Kids Lab / compare-o-meter worksheet.

STEP 5.

Take a picture of your measurement data and put it on the GREAT DATA MAP. You can find it at smartkidslab.nl.

*What you'll need: You can take a photo with a phone or digital camera. THE GREAT DATA MAP can be found at smartkidslab.nl (in the menu bar).

This project has been co-funded by the European Commission within the Call H2020 ICT2015 Research and Innovation action. The grant agreement number is 688620

Making Sense · CINEKID · waag society · SEC Stichting Educatie en Cultuur · Rijksinstituut voor Volksgezondheid en Milieu, Ministerie van Volksgezondheid, Welzijn en Sport

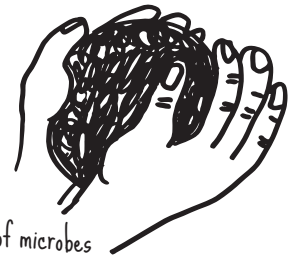
How healthy is the ?

SMART KIDS LAB
compare-o-meter

COMPARE YOUR DATA

LOTS OF MICROBES

Microbes are the smallest living creatures on earth that you can't see. Bacteria, microalgae and fungi are, are examples of these microorganisms.



There are lots of microbes in soil with large amounts of waste material leftover from dead plants and animals.

But there are a lot less microbes in sandy soil (like the soil you might find in a new housing estate).

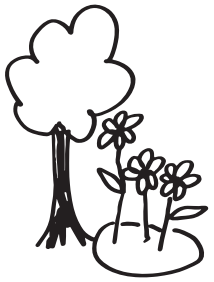
On CONSTRUCTION SITES, the old layer of topsoil is often excavated and replaced with sand. There's a good chance that you won't find too many varieties of microbes in the sand and that only grass will grow afterwards.

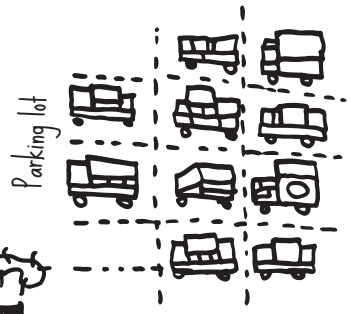
A GOOD AMOUNT OF MICROBES

NO MICROBES = NO LIFE ON EARTH.

Microbes are good for the soil and water, they provide nutrients and minerals that allow plants to grow. Then animals eat those plants. And predators eat those animals. Then those animals poop on the ground and trees drop their leaves, and all that 'waste' is absorbed into the ground again... Where microbes process it! They eat the waste and produce the nutrients. AMAZING!

Microbes are also good for biodiversity. The more microbes there are, the more different types of plants and animals can live in the area. Then everything is in balance.





Nothing grows on 'DEAD' GROUND. Dead ground means too few microbes. You can either turn it into a parking lot or do something to make the soil fertile again. For example, you could add some compost and earthworms. The worms eat the compost, and when they defecate, they make food for microbes. Then your soil is alive again!

TOO FEW MICROBES

How healthy is the ?

SMART KIDS LAB
making meters

DISCOVER HOW HEALTHY YOUR NEIGHBORHOOD IS AND WHAT YOU CAN DO TO IMPROVE IT!

There are millions of tiny microorganisms in the ground called microbes. Generally, the more microbes there are, the healthier the soil is. They're GREAT for plants and biodiversity! But construction and large-scale farming can deplete the soil's microbes and cause many plant species to disappear. Not so great.

Measure how healthy the ground is in your local park or backyard with your own MICROBE METER.

WHAT DO YOU NEED?

- Dirt
- Glass jar with lid
- Electrical wire (different colors)
- Piece of copper
- 2 large screws (silver colored)
- Soldering iron
- Wire strippers
- Voltmeter

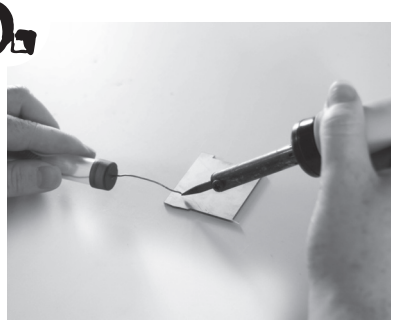
1.

Cut a red and a black wire to about 30 cm in length. Then strip all the ends.

2.

From the black wire, strip off 5 cm extra on one side. Wrap this end very tightly around the two screws as pictured above.

3.



Solder the end of the red wire to the piece of copper.

4.

Place the copper plate on the bottom of the glass jar and drape the wire over the lip of the jar.

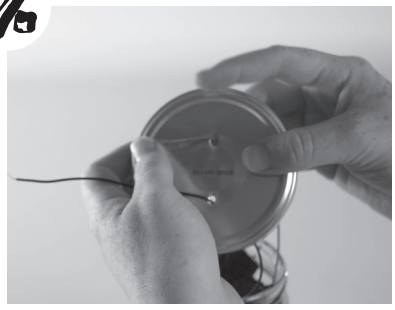
5.

Carefully fill the jar with dirt until it is almost full.

6.

Now insert the screws into the soil and cover them with a final scoop of dirt.

7.



Make two holes in the jar lid, pull the wires through, and gently close the jar. Now connect the voltmeter cables to these two wires.

8.

Microbes are so small that you can't see them. But if you get a lot of microbes together, they produce electric currents you can red with the voltmeter. TIP: Wait a day to get microbe levels up. More Volts means more active microbes in the ground.

TIP Make multiple microbe meters and compare different types of soil.

How healthy is the ?

SMART KIDS LAB experiments

Step 1 Make 3 MICROBE METERS and collect soil from 3 different spots. For example, dirt from the garden, sand from the sandbox or playground, and soil from the forest or park. TIP: Count how many different types of plants (grass, flowers, shrubs, trees) are around each place. Where do you think most microbes live?

Step 2 Wait for 1 or 2 days so that the microbes in your meters have time to grow and generate electricity. While you wait, draw the different places where you gathered your soil.

Step 3

Connect the wires of a microbe meter to those on the Voltmeter. This way you can measure the electrical voltage in Volts (V) that the microbes generate (ask an adult to help you). Do this with each soil sample and write down the numbers you measure on the right. More Volts means more microbes and healthier soil!

PLACE A	PLACE B	PLACE C
..... Volt	..... Volt	..... Volt
How healthy?	How healthy?	How healthy?

Step 4 Compare your measurements with each other. Which soil has the most microbes? Check out the compare-o-meter as well. Where did you count the most plant species? Does the soil from that place also have the highest electrical voltage?

MY RESEARCH CONCLUSION:

Step 5 Take a picture of this worksheet & put it on the BIG data map at SMARTKIDSLAB.NL

SO WHAT ARE ALL THESE MICROBES DOING IN THE GROUND ANYWAY? Fungi and bacteria like to eat the leftovers of dead plants and animals that they find in the ground. These leftovers get mouldy (just like fruit you leave out too long) because there are billions of microbes eating them. When microbes eat, energy is released. You can measure this energy in the soil with the help of your MICROBE METERS. Did you know that those pots of soil you gathered actually are actually a kind of battery where energy is stored! If there are a lot of microbes in the soil, then the 'battery' is full. But what makes soil full of microbes healthy? Microbes convert the decaying remains in the soil into usable minerals for plants. Complicated!! But healthy. Thanks, microbes!