Microbial Transformation (Microbes Lesson Plan)

Science Standards Addressed (From the Colorado Department of Education)
http://www.cde.state.co.us/scripts/allstandards/COStandards.asp?glid=0&stid2=4&glid2=9

Standard 1: Physical Science

- 5th Grade: Outcome 1 - Mixtures of matter can be separated regardless of how they were created

Standard 2: Life Science

- 1st Grade: Outcome 2 - An organism is a living thing that has physical characteristics to help it survive
- 2nd Grade: Outcome 1 - Organisms depend on their habitat's nonliving parts to satisfy their needs
- 4th Grade: Outcome 3 - There is interaction and interdependence between and among living and nonliving components of systems
- 5th Grade: Outcome 1 - All organisms have structures and systems with separate functions
- 5th Grade: Outcome 2 - Human body systems have basic structures, functions, and needs
- 6th Grade: Outcome 1 - Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species
- 6th Grade: Outcome 2 - Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem
- 7th Grade: Outcome 1 - Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment
- 7th Grade: Outcome 3 - Cells are the smallest unit of life that can function independently and perform all the necessary functions of life
- 8th Grade: Outcome 1 - Human activities can deliberately or inadvertently alter ecosystems and their resiliency

Standard 3: Earth Systems Science

- 3rd Grade: Outcome 1 - Earth's materials can be broken down and/or combined into different materials such as rocks, minerals, rock cycle, formation of soil, and sand – some of which are usable resources for human activity
- 6th Grade: Outcome 2 - Water on Earth is distributed and circulated through oceans, glaciers, rivers, ground water, and the atmosphere
- 6th Grade: Outcome 3 - Earth's natural resources provide the foundation for human society's physical needs.

Objective: (Alex, please feel free to add, modify, whatever you need here!)

Micro-organisms, or microbes are microscopic organisms that are comprised of single cells, or cell clusters. Microbes can include bacteria, fungi, archaea and protists. Microbes are everywhere, in dirt, water, air, your body, just about anything you can think of. Most of these microbes are "good" while only a tiny fraction are pathogens. Microbes are an essential part of nutrient recycling, a process where these organisms are essentially decomposers.

One especially neat feature of microbes is that they are adaptive in metabolism. This essentially means that these organisms will "eat" whatever is available. Because of this unique feature, we, as humans, can find creative uses for these microbes. One use in particular is water filtration. We can use these microbes to eat harmful chemicals commonly found in our water supply, and this filtration technique is much less energy intensive than other practices.

Materials:

- Nutrient Agar (Can order online for about $15: set of 10 in dishes with swabs)
- Petri Dishes
- Soil
- Cotton Swabs
- Distilled Water

Procedure:

1. Collect soil
2. Dilute the soil with distilled water (ratio of x to y)
3. Using swabs, swab the diluted soil water onto an agar plate
4. Record your observations on the record sheet by drawing what the plate looks like for the next couple weeks
5. Compare results and think about what the organisms on the plate could eat.

Questions to Ponder:

1. What do you know about microbes?
2. Are microbes bad or good for you?
3. What do we usually think of when we think about microbes?
4. Where can we find microbes?
5. How do microbes affect humans?
6. Can we see microbes?
7. What do microbes eat?
8. How long have microbes been around?

<u>A guide for presenting the activity</u>:

To kick off this lesson, have the students reflect on the questions to ponder. If they don't know what a microbe is, tell them the definition, and give some examples. Discuss as a class the answers and thoughts the students had. If no one mentioned any good microbes, tell the class there are microbes in our body that help us digest food. Yeast is a microbe that we use when baking.

The next part of the lesson involves a quick trip to the school yard. Using a small garden shovel, find some soil nearby, and collect a scoop of soil.

Model for the class how the activity should be carried out. Each group will get soil, water, a vial, cotton swab, and an agar plate. Reinforce that they are not to touch the agar dish with their hands, or they will not have good results. Model mixing the soil with water, and using the swab to swab some of the solution onto the agar. Place the lid back on the petri dish, and set aside.

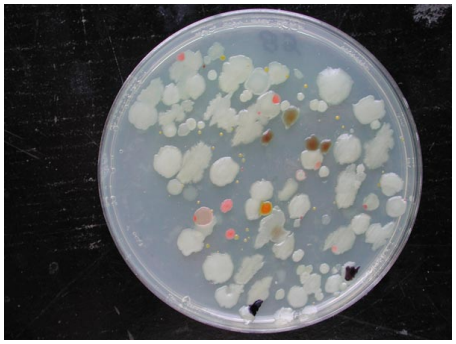
Divide the class into groups of 3 or 4. Have a getter from each team come and get X amount of of soil, Y amount of water in a vial, a swab, and an agar dish. Have each group mix their water soil solution, and swab the agar dish. Put labels on dishes so everyone will know which one is their groups.

Collect all agar dishes, and tell the class that they will be watching these the next couple of weeks and recording their observations.

Print a record sheet for each student for them to use. At some point during each science time, let the students record their observations.

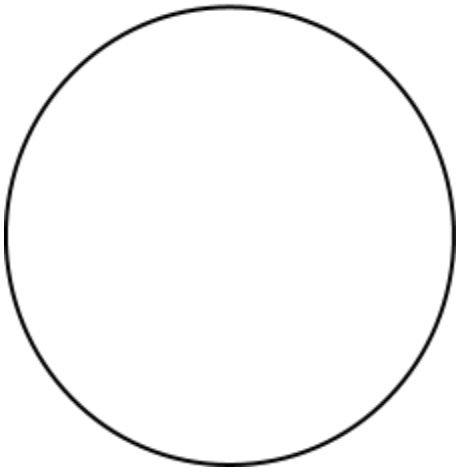
After Z amount of time, discuss the results. What happened? Why did this happen? What does that mean about our soil? Is it bad for us, or good? Discuss the fact that we can use the microbes in our soil to help clean our water. These microbes will eat harmful chemicals we have in our water, and this will clean our water!

Discard the agar dishes appropriately.



Observation Record Sheet

Date: _____



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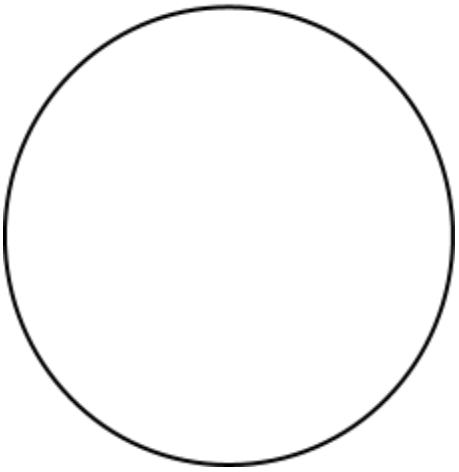

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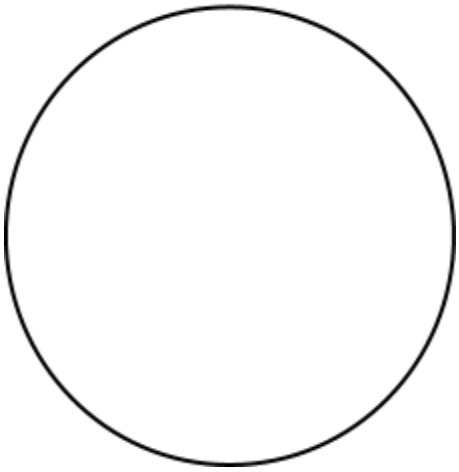

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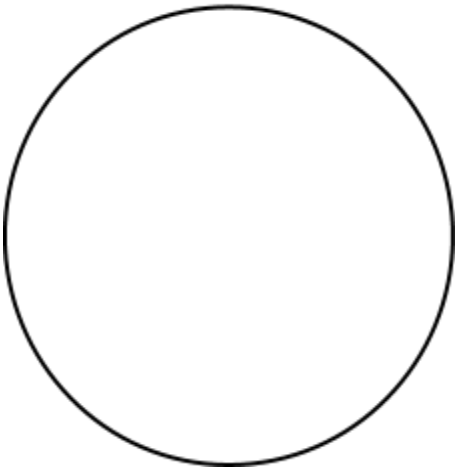

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