



EarthCircles

Water at Work

LESSON 5: NATURE’S WAY

OVERVIEW:

Concept: Water is cleansed naturally in the water cycle when it evaporates and when it filters through the ground. We honor our Seventh Principle when we treat bodies of water with respect.

Lesson At A Glance:

Materials

Preparation

Background

LESSON PLAN

Opening circle

Activity: Kids make a solar still.

Discussion

Principles in Practice

Story

Closing Circle

Materials:

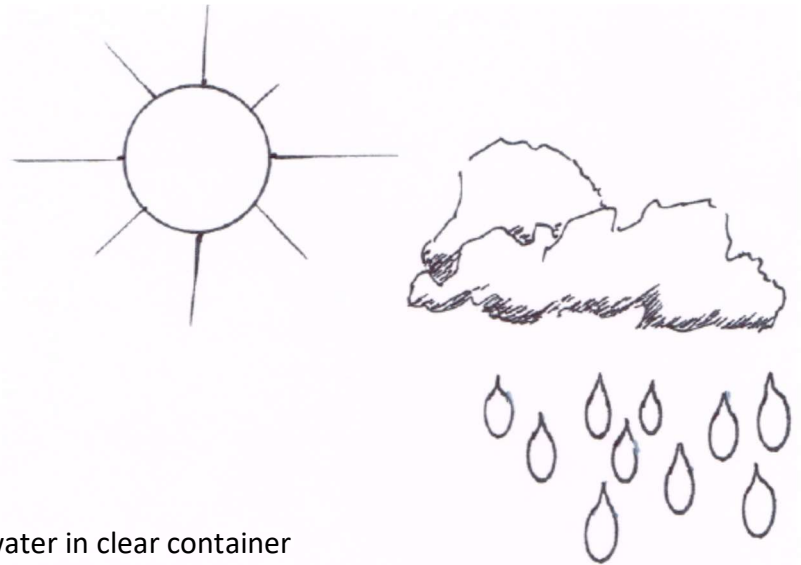
For opening circle: Gallon of dirty water in clear container

For solar still:

- Dirty water
- Quart-size plastic tub
- Small glass, shorter than the tub
- 2 small, clean rocks or glass marbles
- Masking Tape
- Clear plastic wrap to fit over the tub
- Rubber bands
- Access to sunlight
- Tablespoon or small scoop

For filtration:

- Strainer or funnel with filter paper
- Sand
- Dirt
- Dry clay if available
- Dirty water
- 2 clear pint containers
- Paper towels



Book: *Earth, Fire, Water, and Air* by Mary Hoffman and Jane Ray

Preparation:

- Read through the activities and decide what to use with your Kids. You may want to set up a model solar still before class.
- Mix some dirt and dry leaves in a gallon of water and pour some of it into a clear container. Save the rest for the solar stills. Kids can help do this.
- For the solar stills, clear quart-size containers from the groceries work well. A small, short juice glass will fit inside. Other supplies are readily available.
- For filtration, paper coffee filters or a piece of paper towel cut to fit in the funnel work well. It is not needed in the strainer. Have a pint tub each of sand, dirt, and dry clay for Kid teams to access. Each team will need a funnel and filter paper or a strainer, 2 clear plastic containers, and some dirty water.
- <http://www.youtube.com/watch?v=v6TFrv21cxg> to access video clip.

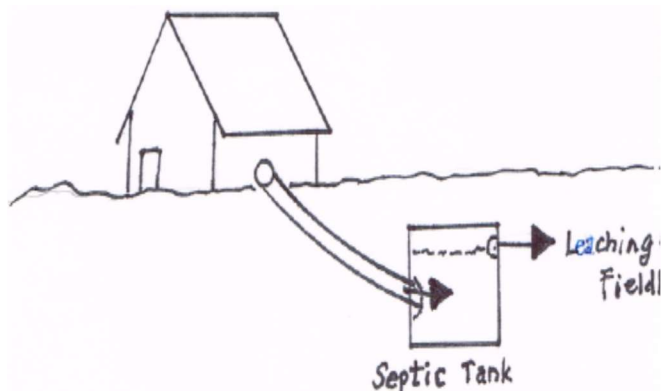
Background for the Teacher:

The water cycle uses the power of the sun to cleanse water naturally through evaporation. Some pollutants are removed when water filters through the soil.

A **solar still** uses the evaporation that takes place in nature. Every liquid evaporates at a different temperature. Anything dissolved in the water either evaporates faster than the water or is left behind when the water evaporates. Thus, when water evaporates, it is pure. Rain and snow may be pure when they form in the clouds, but they soon pick up pollutants from the air and land.

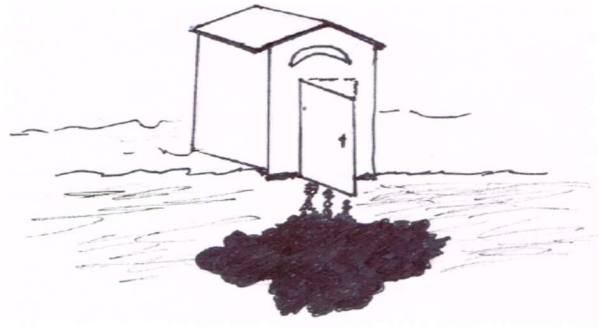
Going back in history, human populations disposed of household wastes including sewage directly onto the streets or into the nearest waterway. This system still exists in remote and undeveloped places, leaving cleansing entirely to nature.

In rural areas where there are no sewer systems and treatment plants, people may use individual septic tanks or perhaps outhouses. A **septic tank** is a large, box-like structure buried in the ground with a connection to the house and a drainage outlet near the top. Bacteria in the tank digest sewage solids and the liquid waste drains into nearby soils.



Two things are essential for a successful septic tank. One, a healthy bacteria population inside the tank is necessary for removal of solids by digestion. Two, nearby soil must be not too sandy, allowing liquid to move too fast for effective filtration, or must not have too much clay, which blocks the flow of liquids and stops filtration. Many states have regulations regarding the placing of septic tanks based on the permeability of soils.

An **outhouse** is a shed placed over a deep hole in the ground. A seat inside has an opening placed over the hole. Human wastes go into the hole. Down in the ground bacteria, worms, and insects decompose the wastes.



In undeveloped countries, and even in remote areas of our country, untreated sewage still goes directly onto the ground or into bodies of water. Especially in densely populated places, this results in polluted water supplies and the spread of disease. This is a major concern of international agencies working to improve conditions in Third World countries.

LESSON PLAN

Opening Circle: With everyone seated in a circle, exchange greetings and note who is present.

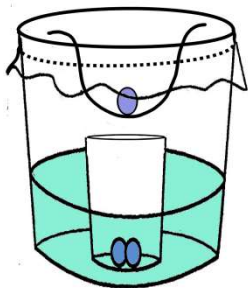
Call Kids’ attention to the container of dirty water.

Note that there is only so much water on Earth and it has been here since the beginning of time. Obviously it gets used over and over.

- How do Kids think water gets clean?
- Where in the water cycle does this happen?

Activity: Solar Still

Tell the Kids that nature cleans water regularly. Today’s project is to set up a **solar still**, which shows how nature uses sunlight to clean water.



To set up a solar still:

- Gather a plastic tub, a small glass, a square of plastic wrap, a rubber band, and three small stones or marbles;
- Put about half an inch of dirty water from the bucket into the tub.
- Put the glass in the center of the tub of water and anchor it with a small rock or glass marble. (If a marble is plastic it will float.)
- Cover the tub with the plastic wrap. Don’t pull the plastic too tight so it has a slight dip in the center. Secure it with the rubber band.
- Place the second rock or marble on top of the plastic wrap and centered over the glass. Do not let the rock touch the glass.
- Place the still in a sunny window. It does take time. Leave the setup in place for a week.

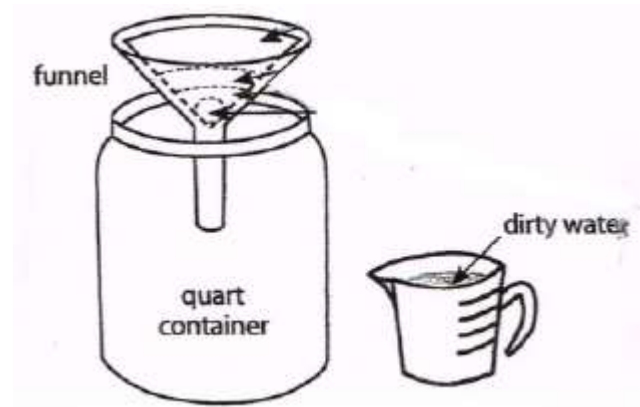
Discussion:

- How much water is in the glass at the end of a week?
- Where in the water cycle does this happen?
- How does pure water vapor in rain and snow get dirty before it reaches the ground?
- This is one way that nature makes water clean, but with too much pollution nature can't take care of it all.
- What do Kids think happens to sewage in undeveloped countries and remote parts of this country?

Activity: Ground filtration

Tell the Kids that nature has another way of cleaning dirty water through filtering as it seeps through the ground. Today we can investigate how this works in different kinds of soil.

Have Kids work in teams of three or four. Teams gather materials as listed on the chalkboard and follow these directions. You may write them on the board or read them aloud for Kids to follow.



- Set up the filtering system:
 - Line the funnel with filter paper, or use a strainer.
 - Place it securely over a collecting container
- Gather a sample of each kind of soil – sand, dirt, and dry clay – on pieces of paper towel.
- Which sample does your team think will do the best job of filtering dirty water? Or would a mixture work better? Examine the soil samples and as a team decide how you want to mix them. Make the mixture, or use just one kind of soil.
- Place your soil mixture in the strainer or funnel in the filter setup.
- Pour dirty water into the setup.

Discussion: Teams compare their soil mixes and how well they filtered dirty water.

- Did some soil mixes clean the water better than others?
- Is any of the water clean enough to drink now?

Describe septic tanks and outhouses to the class, noting that with both systems the dirty water goes into the ground.

- Does anyone have a septic tank at their home? How well does it work? Where does the overflow go?
- How about outhouses? Or Port-a-potties?
- Has everyone used or seen an outhouse? How did they feel about it?

Story: *Earth, Fire, Water, Air* by Mary Hoffman

You may select one or two single-page essays about water for reading aloud from this intriguing book. It includes information about cultural and religious uses of water over the ages as well as basic information.

Principles in Practice:

In how many ways did Kids honor the Seven Principles during this lesson? Ask them to think briefly about each Principle in turn and how their actions honored it. You may list their ideas on the chalkboard and praise their awareness and participation.

Closing Circle:

Ask Kids to repeat these words after you:

Water flows over these hands.

May I use them skillfully to preserve our precious planet.

Gerard Manley Hopkins, *Earth Prayers*

