

Curriculum topics:

- Water
- Resource Conservation
- Environment
- Human Impact

Subject:
Earth/Space Science

Grade range: 3 – 8

Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience through affordable “hands-on” activities that engage students and inspire the joy and discovery of learning.

For more ideas and to see RAFT Locations

www.raft.net/visit-raft-locations

WATER IN THE BALANCE

Make smart choices to keep the demand for water in balance with the supply.



Students create a simple “water balance” and use it to demonstrate the critical relationship between supply and demand for water.

WATER USE CHART

Each day, an average family of 4 uses **400** gallons (1514 liters) of water at home.

Each dot below represents **10** gallons (38 l):

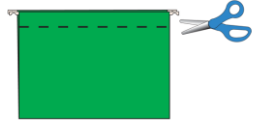
Garden	(12)	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
Toilet	(8)	○ ○ ○ ○ ○ ○ ○ ○ ○ ○
Laundry	(6)	○ ○ ○ ○ ○ ○ ○ ○
Shower	(6)	○ ○ ○ ○ ○ ○ ○ ○
Faucets	(4)	○ ○ ○ ○ ○ ○
Leaks	(4)	○ ○ ○ ○ ○ ○

Materials required

To build one water balance (each balance can be used by 2 to 6 students):

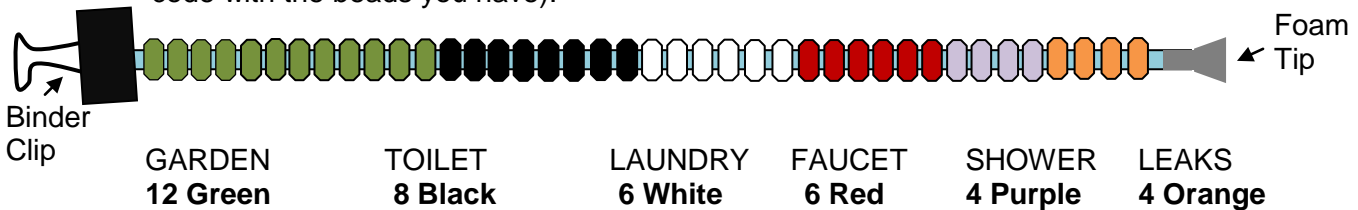
- Ring Beads, 90
(8 recommended colors shown below)
- Binder clip, small, 2
- Binder clip, large, 1
- Cardboard strips, 38 cm (15") X 9 cm (3.5"), 2
- Cardboard strip, 15 cm (6") X 9 cm (3.5")
- 2-part Screw Fastener, ~2 cm (3/4") long
- Foam Tips, 2
- Straws, ~20 cm (8") long, 2
- Hanger (cut from hanging file folder), 1
- Optional: tray

Cut off the metal hanger & paper sleeve from a hanging file folder. The cut should be ~4 cm (1.5") from the top edge as shown.

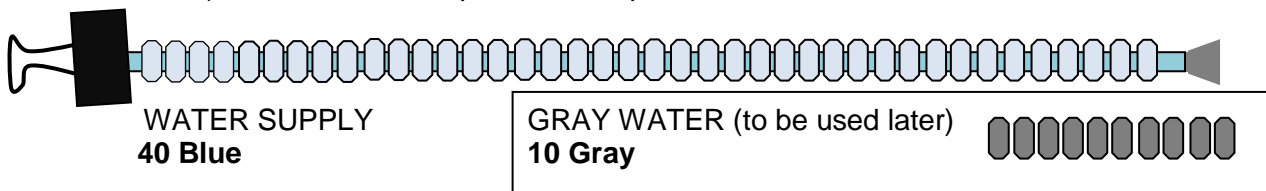


How to build it

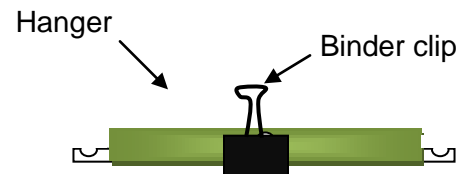
- 1 Create a model of a family's daily water use by stringing 40 beads on a straw, as shown below.** Put a foam tip in one end of the straw and a binder clip on the other end so the beads do not fall off. Use the color code shown below (or create your own color code with the beads you have).



- 2 Create a model of the available water supply by stringing 40 beads on a straw.** Use blue beads as shown below (or create your own color code with the beads you have). Add the binder clip and foam tip.



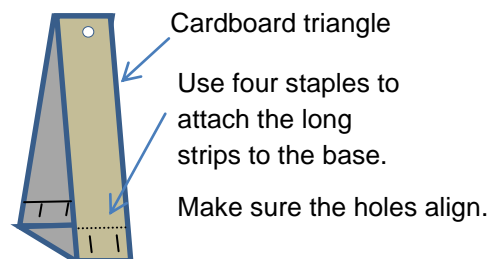
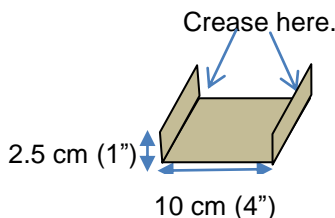
- 3 Attach the binder clip to the center of the hanger as shown.**



- 4 To build the base of the balance:**

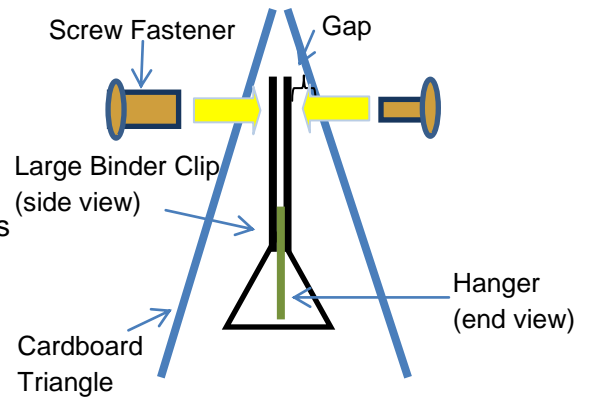
Carefully make a hole at one end of both long cardboard strips as shown at right.

Crease and fold the shorter cardboard strip as shown below.



5 To attach the hanger to the base:

Insert one-half the screw fastener through one hole on the outside of the cardboard base, slide the handle of the binder clip (on the hanger) onto the fastener. Insert the other half of the fastener through the other hole in the base (from the inside). Twist the ends of the fastener together to hold everything in place. Be sure the hanger is able to swing freely. If not, loosen the fastener so there is a gap between the base and the binder clip (see detail to right).



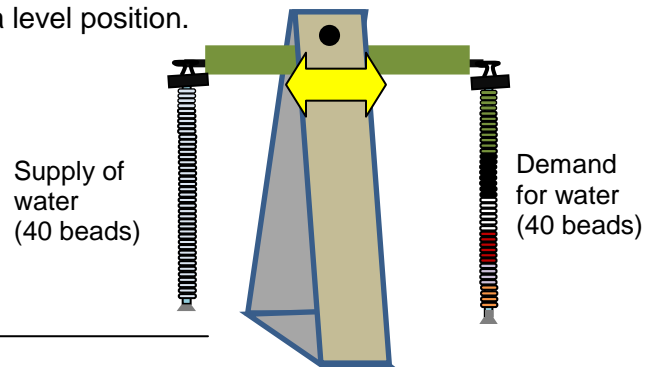
Using the Scale

Hook the two straws with beads on them over the hanger as shown below. Slide the binder clip as needed until the hanger is balanced in a level position.

REVIEW CURRENT WATER USE

1 Notice that the scale is in balance.

The available **supply** of water is equal to the **demand**.



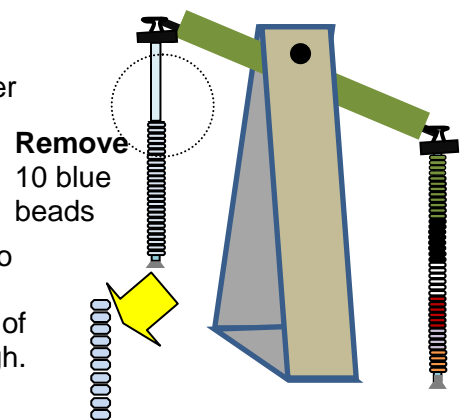
REDUCE WATER DEMAND

2 Remove 10 blue beads from the “supply” side.

The “demand” side will dip down because the demand for water is now greater than the supply.

3 Challenge the students to re-balance the scale.

How many beads need to be removed from the demand side to re-balance the scale? (10) The students can decide which colors of beads to remove to re-balance the scale. Getting rid of the leaks would be a good place to start! But that is not enough. What tough choices will they make to reduce the demand?



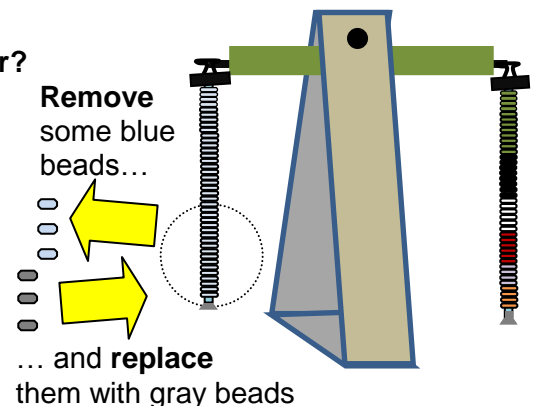
4 Ask student groups to compare their re-balanced scales. Did they all make the same choices? Invite them to discuss their thinking.

USE GRAY WATER WHERE POSSIBLE

5 How much fresh water can be replaced with gray water?

To complete this step, students first determine how much gray water is produced in the home. Gray water is produced by laundry, faucets, and showers. Students determine where it can be used (only in gardens and toilets).

Remember gray water needs to be collected and carried! Water is 8.3 pounds/gallon (1 kg/liter).



Curriculum Standards:

Human Impacts
(Next Generation
Science Standards:
Grade 4, Earth and
Space Science, 3-2;
Grade 5, Earth and
Space Science, 3-1;
Middle School,
Earth and Space
Science, 3-3)

Content Behind the Activity

Water companies, in the United States, measure water in units of 100 cubic feet, called “**CCF**.” (In science “C” often stands for one hundred.) There are about 7.5 gallons in 1 cubic foot, so 1 CCF of water equals about 750 gallons.

The flow of water is measured in “gallons per minute,” (**gpm**) or “liters per minute” (**lpm**). The flow coming out of a kitchen faucet is usually about 2 gpm. To determine the flow rate of a faucet at home, measure how many seconds it takes to fill a jug or cup with a known volume.

Gray water can often be collected from clothes washers, showers, and faucets. **Reclaimed water** (also called recycled water) has been processed in a sewage treatment plant. Both reclaimed and gray water can often be used for gardens and toilets, etc. Neither should be used for drinking or washing. (Be sure to check local gray water regulations.)

Learn more

- Instead of using the Water Use Chart on page 1, have students learn to read a water meter and record actual water use for their home or apartment.
- Businesses, schools and some homes have access to reclaimed water. Students can research good uses for it.

Related activities: See RAFT Idea Sheets:

Energy Game –

<http://www.raft.net/ideas/Energy Game.pdf>

Splash!–

<http://www.raft.net/ideas/Splash.pdf>

Still Water –

<http://www.raft.net/ideas/Still Water.pdf>

Water Cycle in 3D –

<http://www.raft.net/ideas/Water Cycle in 3D.pdf>

Resources

Visit www.raft.net/raft-idea?isid=746 for “how-to” video demos & more ideas!

See these websites for more information:

- **Using gray water** - <http://www.valleywater.org/GraywaterRebate.aspx> and <http://envirohaven.com/cut-outdoor-water-use-by-half-with-grey-water-recycling/>
- **How to read a water meter** - <http://h2ouse.org/resources/meter/index.cfm>
- **Make your own Daily Use Chart** - http://www.mytpu.org/file_viewer.aspx?id=1932