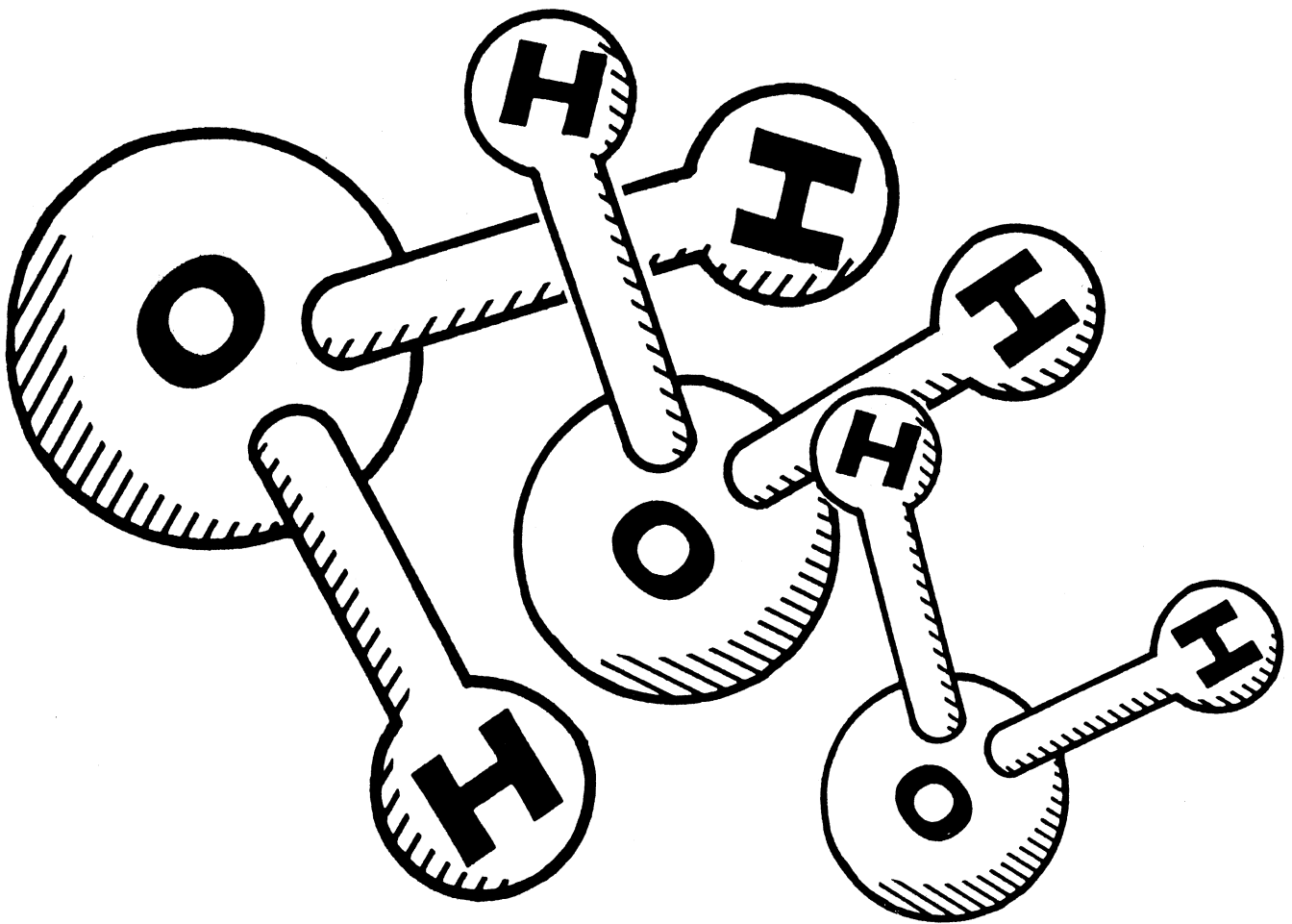


# Teacher's Guide for Hands-on Water Activities

Grades 1-6



# WATER, WATER EVERYWHERE

AND NOT A DROP TO DRINK (ALMOST!)

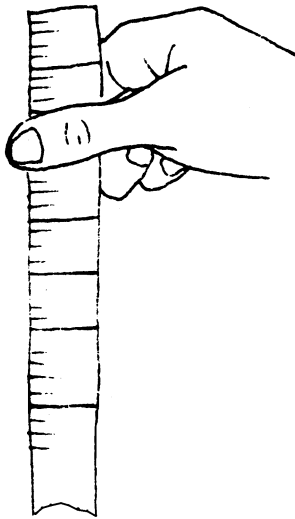
OF ALL THE AVAILABLE WATER IN THE WORLD:

● 97.2% IS SALT WATER

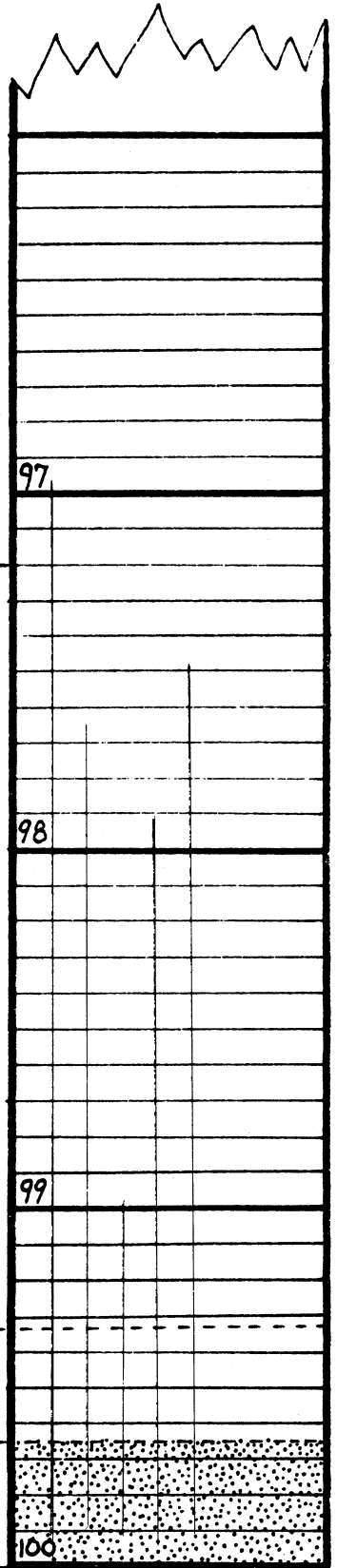
● 2.15% GLACIERS, ICE CAPS

● .31% GROUND WATER, DEEP IN THE EARTH.

● .34% AVAILABLE FRESH WATER: LAKES, STREAMS, WELLS.



DISPLAY A WATER TAPE MEASURE IN THE CLASSROOM.  
OVERALL LENGTH: 8' 4"



## WATER, WATER EVERYWHERE AND NOT A DROP TO DRINK

### Primary Objective

Students will discover that fresh water is available in very small proportion compared to the Earth's total water supply.

### Concepts

1. Three-fourths of the Earth's surface is covered by water, but almost all of the Earth's water is salty.
2. People cannot drink salt water.
3. Fresh water is not easy to obtain in many locations around the world.
4. The world's water distribution:

97.20%	salt water
2.15%	fresh water locked up in the ice caps and glaciers
.31%	ground water--too deep in the Earth to reach
<u>.34%</u>	fresh water available in all of the lakes, streams, and wells in the world
100.0%	

5. Anyone can practice water conservation at school, at work, or at home.

### Materials Needed

- 200 square inches of tag board (three 8 1/2-by-11 pieces will work)
- 10 2-by-10-inch strips of water tape measure
- masking tape
- cement glue
- ruler
- scissors

### Procedure

1. Using the illustrated example, cut 10 strips of paper 2-by-10 inches in size and mark off lines at one inch intervals on each strip.
2. Glue strips of water tape flat onto sheets of tag board.
3. Cut out around strips of now reinforced water tape.
4. Use masking tape to tape tag board ends together.
5. Number the one-inch lines, from one to 100 as illustrated; then at the terminal end, roughly mark off the percentages indicated in Concept 4. Use a highlighter pen to color each proportion of the water supply. (Leave the 97.2 percent salt water portion white.)

6. First ask students how much of the world water supply is available for us to drink. Stretch the water tape out in the classroom and discuss the availability of fresh water in the world.
7. Brainstorm about ways students can conserve water at school and at home.

Activities: Discuss, Demonstrate, Compare

1. Where does most of the fresh water supply to our homes come from? (lakes, streams, aquifers)
2. Where does most of the fresh water enter the water cycle? (evaporation of ocean water and transpiration from plants)
3. How much available fresh water do we have in the world? (refer to Concept 4)
4. Since there is relatively little fresh water available in the world, can we think of some of the ways we can use our water wisely?

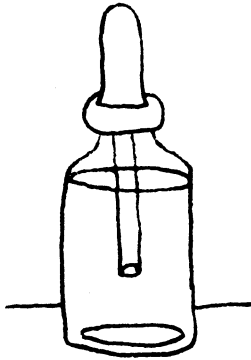
# WATER TAPE MEASURE... PAGE 1

1	11	21	31	41
2	12	22	32	42
3	13	23	33	43
4	14	24	34	44
5	15	25	35	45
6	16	26	36	46
7	17	27	37	47
8	18	28	38	48
9	19	29	39	49
10	20	30	40	50

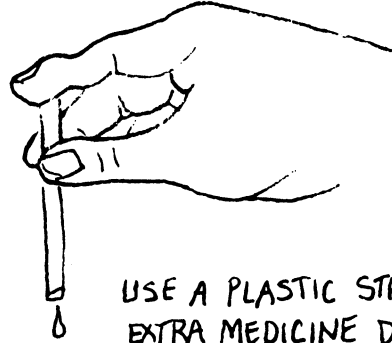
WATER TAPE MEASURE...PAGE 2

51	61	71	81	91
52	62	72	82	92
53	63	73	83	93
54	64	74	84	94
55	65	75	85	95
56	66	76	86	96
57	67	77	87	97
58	68	78	88	98
59	69	79	89	99
60	70	80	90	100

# WATER POLO

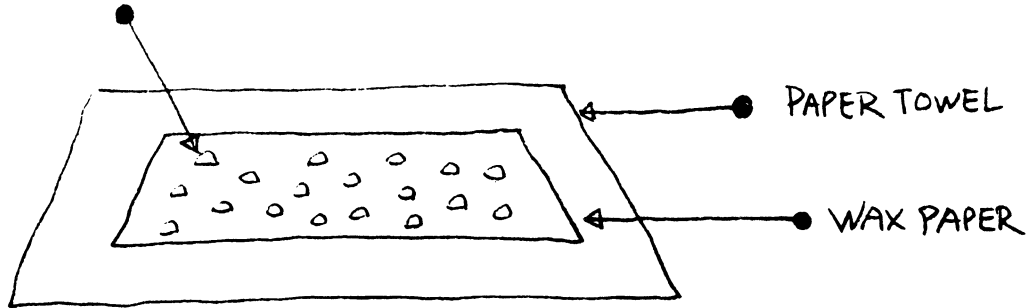


MYSTERY SOLUTION



USE A PLASTIC STRAW FOR AN EXTRA MEDICINE DROPPER. HOLD END CLOSED WITH INDEX FINGER & SQUEEZE STRAW WITH THUMB & BIG FINGER.

BEADS OF WATER



## WATER POLO

### Primary Objective

Students will be able to explain that beads of water are caused by water's invisible elastic skin - surface tension.

### Concepts

1. Water has special properties which give it surface tension.
2. Water is attracted to water; this is called cohesion.
3. Water is attracted to other surfaces; this is called adhesion.
4. Water surface tension can be broken with dish soap or detergent.

### Materials Needed

- half-straws or medicine droppers
- wax paper squares (about 7" squares)
- styrofoam cups half full of water
- toothpicks
- paper towels
- vial of detergent

### Procedure

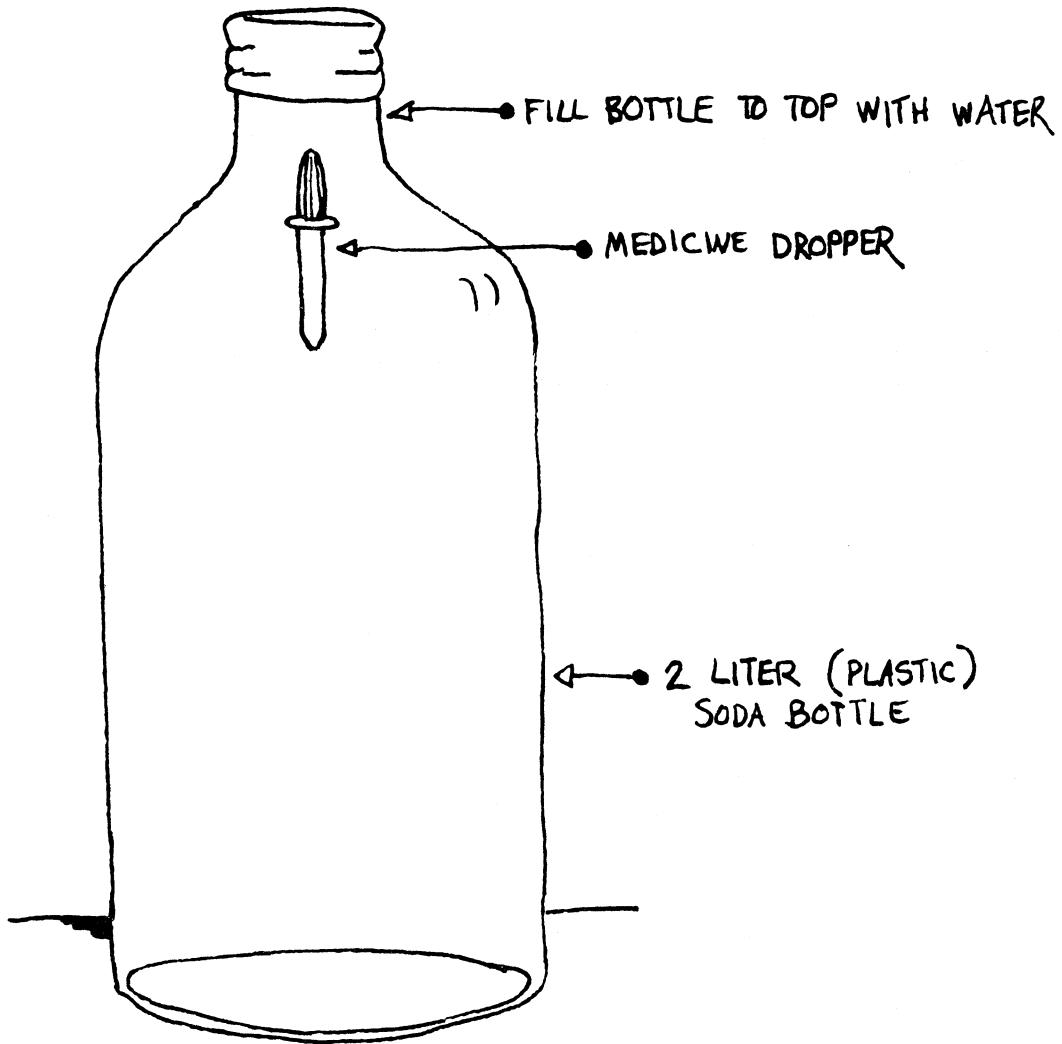
1. Give each student a toothpick, paper towel, sheet of wax paper, 1/2 cup of water, and a half-straw or eye dropper.
2. Put the wax paper square on top of the paper towel.
3. Use a straw or an eye dropper to pick up water and drop beads on the wax paper. Use the blunt end of the toothpick to move the water beads around, connecting and disconnecting water droplets.
4. Point out to students that the beads of water are attracted to each other. After a few minutes of playing water polo, announce that you will now dip your toothpick into the "mystery" solution. (detergent)
5. If you are having everyone do the activity, tell students to hold their toothpicks in the air until the whole class has dipped into the mystery solution. Then have them play water polo again by using the toothpick to lead the droplets around.
6. The mystery solution will break the water surface tension and the water may leak through the wax paper.
7. You can have the students use the paper towels to clean the top of their desks.
8. Ask students how they think detergent cleans things.



Activities: Observe, Experiment, Discuss

1. What happens to beads of water when they bump into one another? (They unite with other beads of water.)
2. What happens to beads of water when touched with the mystery solution? (They break like popping a balloon.)
3. Would someone like to guess what the mystery solution is? (detergent)
4. Why is detergent a good solution to use to clean our desks? (Because it breaks the surface tension of water and dissolves oil and fat.)
5. Why is it important to use soap or detergent to wash? (Because it breaks water surface tension so water can flush dirt away.)

# CARTESIAN DIVER



## CARTESIAN DIVER

### Primary Objective

Students will learn that water is incompressible, so pressure simply makes it move into any available space.

### Concepts

1. Science is not really magic but sometimes appears to be. This is what causes scientists to seek explanations.
2. Initially, the air in the top of a medicine dropper will cause the dropper to float in water.
3. As pressure is applied to the outside of the plastic bottle, more water is forced into the air space in the medicine dropper, so the dropper sinks. (The air molecules are compressed into a smaller space.)

### Materials Needed

- empty 1 or 2-liter clear plastic bottle with cap
- medicine dropper
- water

### Procedure

1. Fill the plastic bottle with water. (Make sure the plastic bottle is fairly new so it is not brittle and prone to breakage.)
2. Fill the medicine dropper with a half inch of water.
3. The medicine dropper must be able to float near the top of the bottle.
4. Screw the cap on the bottle.
5. Tell students you have magical powers with your eyes.
6. Use both hands to hold the bottom of the bottle.
7. Look at the medicine dropper and squeeze the bottle with a finger concealed by your other hand. The medicine dropper will sink to the bottom of the bottle.
8. Hide the bottle until the next day to let the students think about the problem.

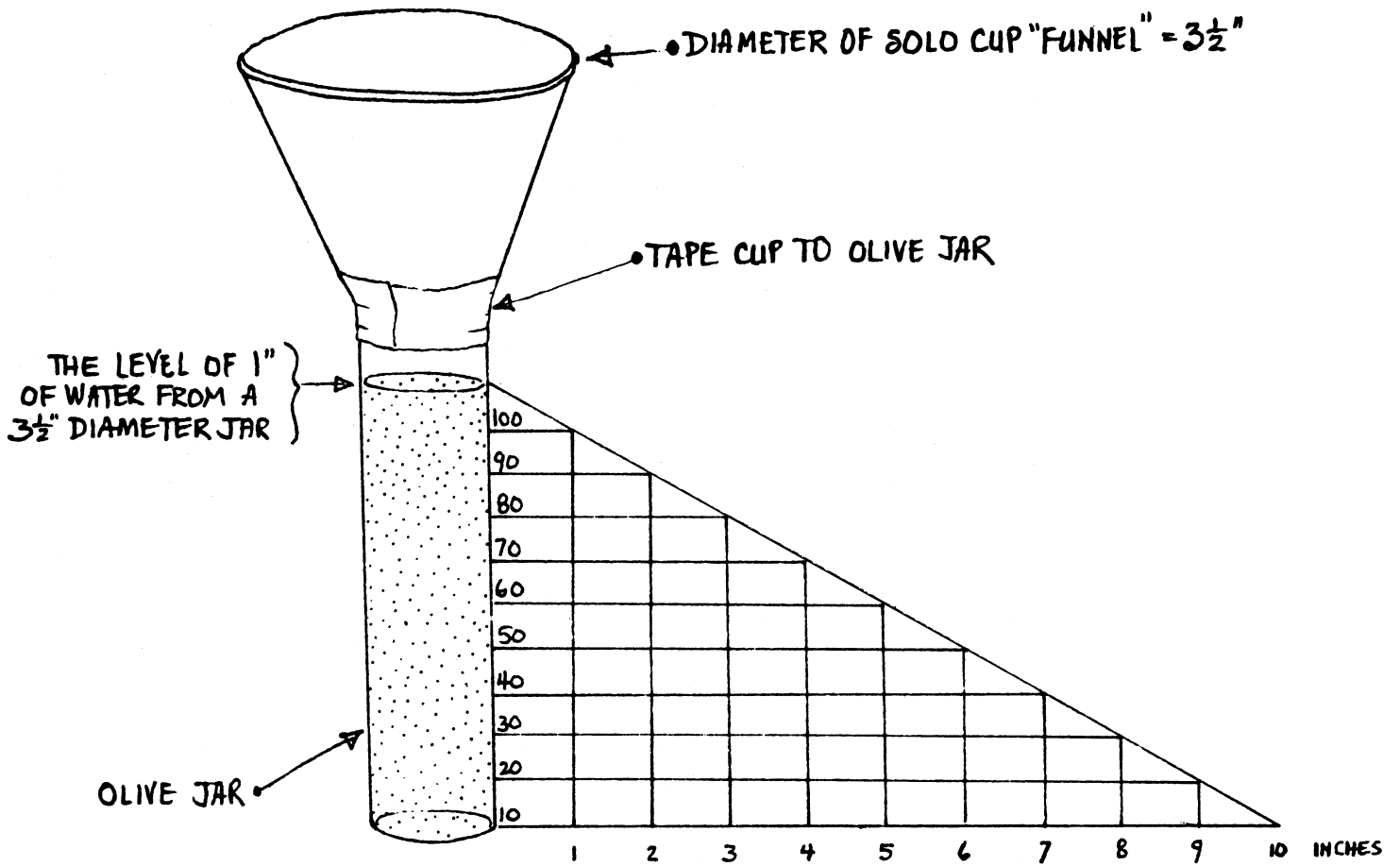
### Activities: Observe, Predict, Experiment, Discover

1. The class can be divided into groups to work together to solve the

problem. In this case, each group should have a separate set of materials.

2. First demonstrate the Cartesian diver (the dropper in the bottle) for them.
3. What causes the medicine dropper to stay afloat? (The air inside the medicine dropper.)
4. What causes the medicine dropper to sink? (Air is compressed allowing water to enter the dropper.)
5. Allow the students to discover how the Cartesian diver works. The students may eventually discover that pressure applied to the outside of the bottle will cause the medicine dropper to sink. (If they give up, explain.)

# SOLO CUP RAIN GAUGE



## SOLO CUP RAIN GAUGE

### Primary Objective

Students will understand one method for measuring rain.

### Concepts

1. A rain gauge is used to collect and record precipitation data.
2. Rainfall can be measured to the nearest 100th of an inch.

### Materials Needed

- plastic Solo cup (usually about 3-1/2 inches in diameter at the top)
- narrow pickle or olive jar (straight sides)
- jar 3-1/2 inches in diameter at the base and sides
- large index card or stiff paper
- ruler

### Procedure

1. Cut out the bottom of the plastic solo cup.
2. Tape the bottom of the cup into the top of the empty pickle or olive jar.
3. Measure the diameter of the top of the plastic solo cup.
4. Find a jar that, at its base, has the same dimension as the top of plastic solo cup.
5. Fill the jar with water to a height of one inch.
6. Pour the one inch of water into the pickle or olive jar. The level of this quantity of water represents one inch of water falling into the top of the rain gauge.
7. On the bottom edge of the paper, draw a straight horizontal line and mark off ten inches.
8. On the left margin of the paper mark off the height of the water in the gauge and draw a vertical line.
9. Make a triangle by extending a line from the water level mark down to the ten-inch mark on the paper.
10. Draw a  $90^{\circ}$  angle line going up to the sloped side of the triangle for each increment marked on the ten-inch line (see example). Then draw lines at a  $90^{\circ}$  angle from the left vertical margin across to the end of each line on the slope. This divides the left horizontal line in exact tenths.

11. Divide each into into 5 equal parts so that each increment is 2 hundredths of an inch.
12. At this point you can either mark the increments on the rain gauge jar with a permanent marker or use the paper taped to the jar to measure rain amounts.

Activities: Demonstrate, Discuss, Measure

1. How do you know how much water or rainfall comes down from the sky? (by collecting the water from each rainfall and measuring it in a gauge)
2. How do we know how much rainfall we receive each year? (by keeping records of daily precipitation)
3. Compare the rain data collected by the class with rain data from local newspapers.
4. Discuss how much more water is needed if there is a drought or a year with low rainfall.
5. If this is a year with low rainfall, discuss the need for water conservation.
6. Discuss that in California most of our farms and homes use more water from irrigation than they get from rainfall. Irrigation is artificial rain.