



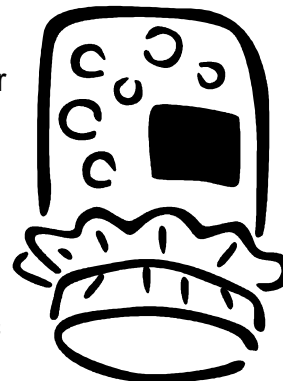
**Maitland P. Simmons Memorial Award
Summer Institute-2006
Demonstration**

“Magic Jar”

Application: Physical Science, Nature of Science, Observations, Inference, Surface Tension of water, Air Pressure

The molecules of water are held together by strong forces of attraction called “hydrogen bonding”. The surface of a sample of water is very strong due to the net force of attraction directed perpendicular to the surface towards the interior of the liquid. Small objects such as a needle, paper clip or insect are able to “float or walk on water” since the downward pull of gravity is insufficient to break the attractive forces holding the water molecules at the surface together.

Air pressure “pushes” on everything at a force of approximately 14 lbs/sq. ft. Air does not just push down, but all around the surface of objects. If the surface area of an index card is sufficiently larger than the opening of the jar, the force of the air pushing UP on the card will hold water in the jar.



Materials:

- 2 canning jars with ring but no lid
- Window screen
- Index card
- Faucet or pitcher of water
- Sink or wash basin

Safety Precautions: Always follow safe laboratory practices

Preparation:

Use the ring of one of the jars to cut a circle of window screen about $\frac{1}{4}$ ” larger than the opening of the jar. Place screen over the mouth of jar and screw ring on to secure screen in place. Place jar, and second jar with no screen on demo table next to each other. Place index card over jar with screen.

Demonstration Procedure:

As students enter, all they should see on table is two jars. They will think that they are the same because the jar with screen has card over the top. Begin a discussion about the “Scientific Method” and how it is used to solve a problem or answer a question. Using the jar without the screen, fill the jar to the top and place the index card over the opening. Have students predict what will happen if the jar is inverted. Invert the jar, holding the card in place with your hand. Have students predict what will happen when your hand is removed. Discuss how this is part of the “Scientific Method”. Observation: “jar is full of water, card is on top”; Question: “what will happen when hand is removed”; Hypothesis “water will fall out” or “water will stay in”; Experiment/Test: remove hand and observe what happens... Have students predict the reason for the outcome. Explain the concept of air pressure pushing up on the

card. Remove the card, allowing the water to fall into the sink or basin. Pick up second jar, while explaining to students that “All good scientists repeat their experiments”. Fill second jar (with screen) and repeat the process and questions. This time the students will feel that they know the outcome. When you remove the card, however, the water will not come out.

Outcomes: The students will not be able to see to screen in the jar. Most will quickly come to the conclusion that there is SOMETHING different about the jar, but not sure what. This could lead to a discussion of variables in an experiment. Tilting the jar slightly will allow air to enter, forcing some water out.

Disposal: Store jar for future use

References: George Gross, Union HS. Adapted from “One Way Screen”; Demo A Day, Vol 1
Bilash, Gross and Koob