

# Lota Bowl

## Critical Thinking and Problem Solving



### Introduction

A container is filled with water. The water is poured out of the container until it appears empty. In a few minutes, more water naturally appears in the container and it is also poured out. The lota bowl is a classic part of many magic shows. A version of it has been around since the time of the ancient Greeks. The apparent “magical” properties of the container make it an excellent device to teach problem-solving in many science classes.

### Concepts

- Problem-solving
- Air pressure

### Materials

Lota bowl

Large container to fill the lota bowl

Beaker, flask, or glass

Water

### Safety Precautions

*Although the materials used in this demonstration are considered nonhazardous, observe all normal laboratory safety rules.*

### Preparation

1. Fill a sink or container with enough water to submerge the entire lota bowl.
2. Place the lota bowl in the water and allow the bowl to completely fill. The bowl is filled when no more bubbles appear on the outside of the bowl. Pour out excess water until the water level lines up with outside hole.
3. Wipe all excess water from the outside of the lota bowl.
4. Place the lota bowl on a stand or countertop with the top hole facing away from students.

### Procedure

1. Casually show water in the lota bowl to a few students. Pour the water inside the lota bowl into a beaker or flask while keeping your finger over the *outside* hole (see Figure 1). Try to keep this outside hole away from student view.
2. Place the lota bowl back on a small stand or countertop and uncover the outside hole by removing your finger. The lota bowl will partially refill with water. Allow at least a minute for the bowl to refill.
3. Place your finger over the outside hole again and pour more water out of the lota bowl. Always keep your finger over the outside hole while pouring.
4. Replace the lota bowl on the stand or countertop, uncover the hole, and allow the inside bowl to again refill with water.
5. Repeat steps 3 and 4 for as long as you want to “milk” the presentation.

### Disposal

Empty any water remaining in the lota bowl before storing.

### Tips

- Practice handling and pouring water from the lota bowl until covering the top hole looks natural.
- You can add more swirling and shaking of the bowl toward the end to give the impression that there are still large amounts of water being poured out of the container.

- This can also be done as a type of running gag throughout a class period. Pour the water once and then go onto some thing else. Return later in the same period and pour again. This can be done multiple times. It may take two or three pourings before students start questioning the device.

## Discussion

This lota bowl is an excellent device to use during discussions on air pressure or gas laws. It also has the essential properties to be a great problem-solving activity. The lota bowl is a container that has two shells. The inner shell holds water that is seen by the audience and poured out. There is also a hidden outer shell that contains a large amount of water between the outside wall and the inner shell that is not seen by the audience. When the inner shell is empty, some of the water from the outer shell will enter the inner shell once the outer hole is opened to the atmosphere. This process can be repeated many times although the amount of water being poured will gradually diminish. The water in the outer shell is able to enter the inner shell through another hole in the bottom of the inner shell (see Figure 1).

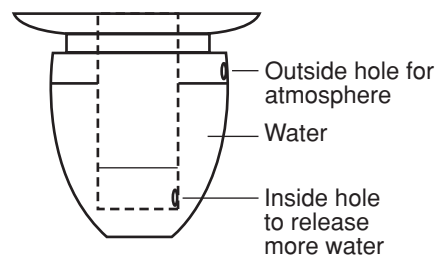


Figure 1.

An assignment to explain this device becomes interesting. As students begin to draw a sample model, they will usually leave out the outside hole. This outside hole is necessary to equalize pressure and prevent air lock. When the outside hole is sealed, most of the water stays in the outer shell and does not enter the inner shell. This is why there can be multiple pourings. As students attempt to build a model of the lota bowl, they will typically notice the necessity of the outside hole. Models can be built using different sizes of plastic cups or plastic soda pop bottles and a hole punch.

The lota bowl also provides an excellent opportunity to discuss the effects of atmospheric pressure.

## Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

**Unifying Concepts and Processes: Grades K–12**

Evidence, models, and explanation

**Content Standards: Grades 5–8**

Content Standard A: Science as Inquiry

Content Standard B: Physical Science, properties and changes of properties in matter

**Content Standards: Grades 9–12**

Content Standard A: Science as Inquiry

Content Standard B: Physical Science, structure and properties of matter

## Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Lota Bowl* activity, presented by Jeff Hepburn, is available in *Critical Thinking and Problem Solving*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

## Materials for *Lota Bowl* are available from Flinn Scientific, Inc.

Catalog No.	Description
AP6212	Lota Bowl

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.