

Demo #1 – Magic String

Useful in Units: Physical Chemistry, Bonding

Background and Uses

This is a demo I have used the first day of school. It is simple and relays to my students that the class will be fun, but that they will need to be able to learn and have fun at the same time. As simple as it is, students are amazed by this demo. Parents are equally as amazed when I show it to them on Parents Night.

The concept shown in this demo has a couple of different terms depending on what course and depth you are teaching the concept. I remember in 7th grade technology and in Earth Science the concept being referred to as the “cohesion” of water. This term is also commonly used in the real world. In chemistry, we refer to this as “Hydrogen Bonding” – the intermolecular force that causes certain compounds to be very attracted to each other. Hydrogen Bonding is the reason why water and some other compounds have higher than expected boiling points.

Alterations to try and pitfalls for this demo:

1. Make sure to soak your string for a little while ahead of time. You want the string to be fully saturated with water.
2. Have students make guesses as to why the “string” is so magical. Try it with dry string and show that it is not the string at all.
3. Make sure that the string is taught – it doesn’t work well if it is not.
4. See how long a piece of string you can use and still get water from one beaker to another – the longer the string the more water that will be required. (I’ve gotten it to work with string that is more than 20 ft. long with help from students (sorry, around 6 m)).

Concepts the Demo Illustrates:

Cohesion, Hydrogen Bonding, Intermolecular Forces

Where I found this demonstration:

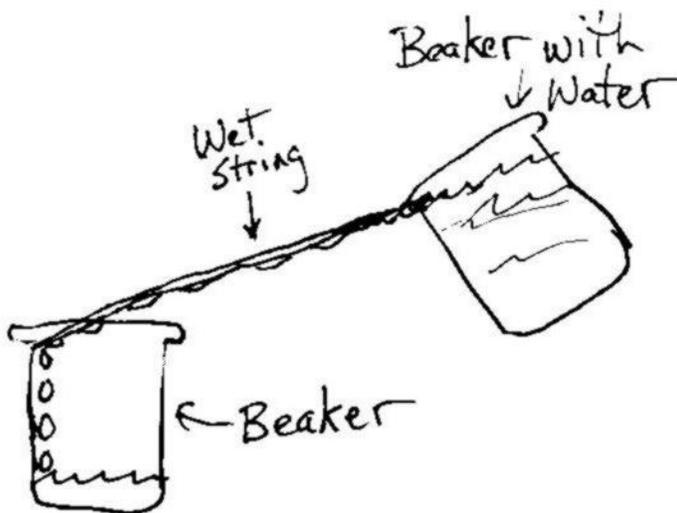
Paul Scott, a science teacher from Niskayuna High School in Niskayuna, NY was the first person to show me this demo. Paul was my “Science Methods” professor in the MAT program at Union College in Schenectady, NY. He, more than any other person, molded my teaching philosophies to use demonstrations and science news as key components of getting students to think analytically while getting them excited about science at the same time. The procedure I have written up is based on the demo Paul first showed me.

Procedure

Materials required: 2 Beakers (250 mL or more), Water, String (2 to 3 ft.)

Procedure:

1. Fill 1 beaker with water and add string so that it has time to soak.
2. Take wet string out of water.
3. Hold the string between the 2 beakers and elevate the filled beaker higher than the empty beaker.
4. Pour slowly – The water will follow the string from one beaker to the other dripping only very rarely. See picture:



What to illustrate with this demo:

1. That it is the water on the string, not the string itself, that is allowing the water to be transferred. Try repeating the demo with dry string – the water will pour onto the table no matter how slowly you try to pour it.
2. Water molecules are attracted to other water molecules. It can be said that water has strong intermolecular forces, strong attractive forces, Hydrogen Bonding, or cohesion.
3. The reason that the water can “walk” across this string is the same reason that water has a higher than expected boiling point.