Week 13b – Humming Glass (VanCleave's #162)

Prep Notes	
Materials	Stemmed glassware (thin glass works best) A thin layer of vinegar in a shallow bowl (for finger-dipping)
Teacher Background	Sound originates from a vibrating object. Objects can be struck, plucked, rubbed, or otherwise excited into vibration. Some objects vibrate very little, emitting only a very short sound (e.g., a knock on the table); other objects can be excited into a harmonic resonance, where the vibration continues on with little or no further excitation (e.g., the plucked string of a guitar). This project involves a stemware glass being vibrated to such a resonant state to produce a ringing "note".
Opener Ideas **(same as week 13a – spoon bell)**	• What things make sounds? (Noisy babies, instruments, cars, bugs, etc.) • How can you describe sound? (High/low volume, High/low pitch, harmony/cacophony) • Where can sounds be heard? ("everywhere", even under water, but not in space!)
Grammar **(similar to week 13a – spoon bell)**	• **Friction**: one surface rubbing against another • **Vibrate**: wiggle back and forth (demo: "twang" a ruler, as in VC experiment #163, or pluck a rubber band) **very** quickly • **Amplitude**: the strength (loudness), measured as the "height" of the sound wave, usually measured in decibels (dB); sounds over 90-100dB are "very loud", and could damage ears • **Frequency**: the speed of the vibration, measured as the "width" of the wave humps, measured in vibrations per second (Hertz, or Hz)
Scientific Method	
Observations	...about sound, focus on "long" sounds (like instrument notes) versus "short" sounds (like thumps, bangs, or knocks).
Question	Can we make a glass vibrate like a guitar string? How?
Hypotheses	"Yes" or "no" – How? "pluck"? "rub"? Shake back and forth?
Experiment (Procedure)	• Wash your hands and the glass in warm soapy water, then rinse well. • Hold the base of the glass to the table with one hand. • Wet your index finger in the shallow vinegar • Gently rub the wet finger around the rim of the glass
Results	The glass should begin to "hum" or "ring", possibly very loudly
Conclusions	Yes, we can cause the glass to resonate by rubbing its rim and producing enough friction to cause the glass to vibrate.
More	
	• You could actually "flick" the glass with your fingernail and get it to vibrate and make a "long" (lingering) sound, but this project focuses on vibrating the entire glass harmonically so that the sound is rich and strong. Friction is the best way to excite the glass to this state of "constructive interference", to get the harmonic resonance. • The washing of hands and glass removes oils that may "lubricate" your motion and reduce the effects of the friction. Likewise, the vinegar dissolves oils and increases friction. • A given glass will have a specific pitch based on its design/shape/material.