# Low-Tech Demonstrations

Patricia Humphrey
Georgia Southern University
phumphrey@georgiasouthern.edu

One can do some great demos (and simulations) with applets, Fathom, etc. but not all classrooms are technology equipped. I present some of the low-tech demos and activities I have used for such topics as p-values, the Central Limit Theorem, and Expected Value.

Our classrooms are equipped only with a chalkboard and overhead projector. Thus, our technology of choice is the TI-83/84 (with viewscreen).

Some of the demonstrations and class activities I use are:

1. P-values and Power – a simple demonstration that requires two identical decks of cards, and TI calculators to simulate the probability.

2. Expected Value – the Hermit's Epidemic is simulated by each student using one die for each. Each student simulates several "epidemics" and computes their own mean number of sick hermits. The class as a whole then determines the probability distribution for the number of hermits to become sick, then the theoretical value of the mean. We also collect each student's mean and graph them to demonstrate the unbiasedness and smaller variance of the mean.

3. Central Limit Theorem – Demonstrated by revisiting the Hermit's Epidemic, as well as through graphing calculator programs for various distributions.

4. Labs – each semester we do four mandatory "data collecting" in-class lab exercises with an "extra credit" optional lab done completely out of class. The labs are designed to model "real world" uses of statistics using real data. These were modeled after some of the Labs in Spurrier, et al, Elementary Statistics Laboratory Manual, Duxbury, 1995, but were modified to fit our technology as well as the desired outcome of each lab. The five labs are

a. Variability and Heart Rates. Requires only a stopwatch for the instructor. Purpose is to investigate the impact of additional measurement time on average heartrate, as well as on the variability of the measurements. Students use one-variable graphics and descriptive statistics.

b. Real and Perceived Distances. Requires several long tape measures. Students guess the distance to each of 13 landmarks. They then measure (in groups) the actual distance to the first twelve, compute a linear regression based on their guesses for the first twelve, and use the regression to calibrate their guesses to the last landmark (which the instructor has pre-measured).

c. A Question of Taste – a version of the classis Coke vs Pepsi taste test. Requires two versions of at least one type of product (generally a name brand vs store brand). Students discuss the merits of the experimental data collection method and compute binomial probabilities to decide brand "preferences."

d. Variability in Manufactured Products – we use bins of roofing nails and vernier calipers to investigation natural variability of "assembly line" products. Students measure the

length and head diameters of a random sample of nails from their bin, and use inference procedures to determine whether or not the nails "meet specs." This lab is intended as a "capstone" exercise, so they also produce one- and two-variable graphs, and investigate whether or not there is a linear relationship between length and diameter.

e. Automobile Preferences – the out-of-class data gathering consists of taking a random sample of cars in a parking lot, and determining whether the car was Japanese-made or not. They also choose two attributes which may help our "domestic" car dealer sell additional cars. The emphasis is on inference for proportions.

I will be provide some copies of student handouts. All materials are also available from www.cs.georgiasouthern.edu/faculty/humphrey_p/.