Active Methods for Teaching Central Tendency

David Lane, Rice University
Webinar, 5/24/2011

The Problem

* Central tendency is a key concept in statistics.

* It is covered in every statistics textbook.

* It is a vague concept lacking a single "correct" definition.

Traditional Method

* Textbooks rarely define central tendency apart from its measures.

* It is typically defined in terms of how to measure it (mean and median)

* Reminiscent of a half-in-jest definition of intelligence as what is measured by intelligence tests (Boring, 1923)

* It is likely students equate the concept with its most common measures.

Some Definitions

* Hard to find definitions in introductory texbooks

* Below are from the web

  ● "where the middle of a bunch of data lies." (icoachmath.com)

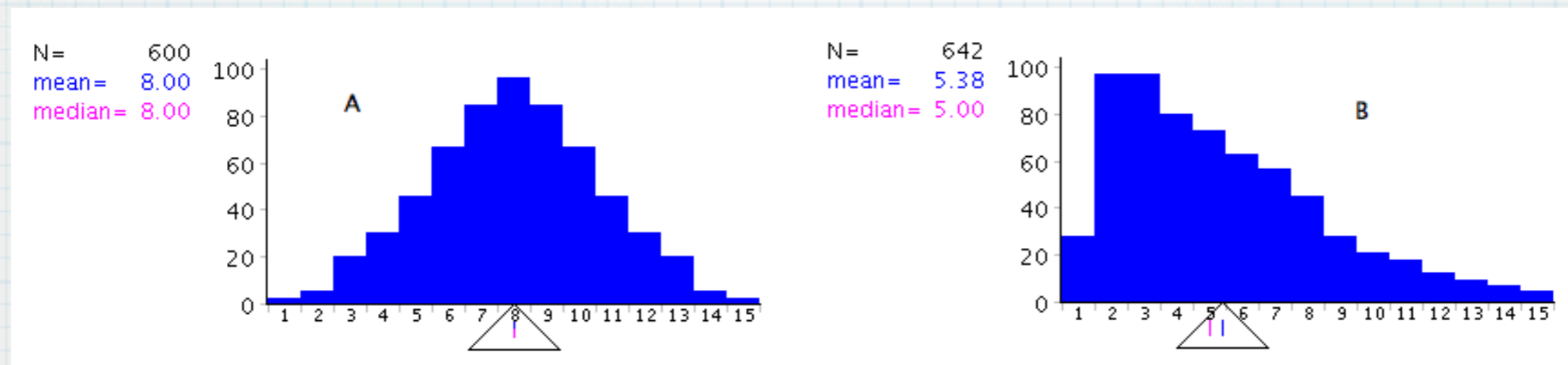 ● the degree of clustering of the values of a statistical distribution" (merriam-webster.com)

Some Specific Definitions

* The point at which the distribution would balance.

* The point that minimizes the sum of absolute deviations.

* The point that minimizes the sum of squared deviations.
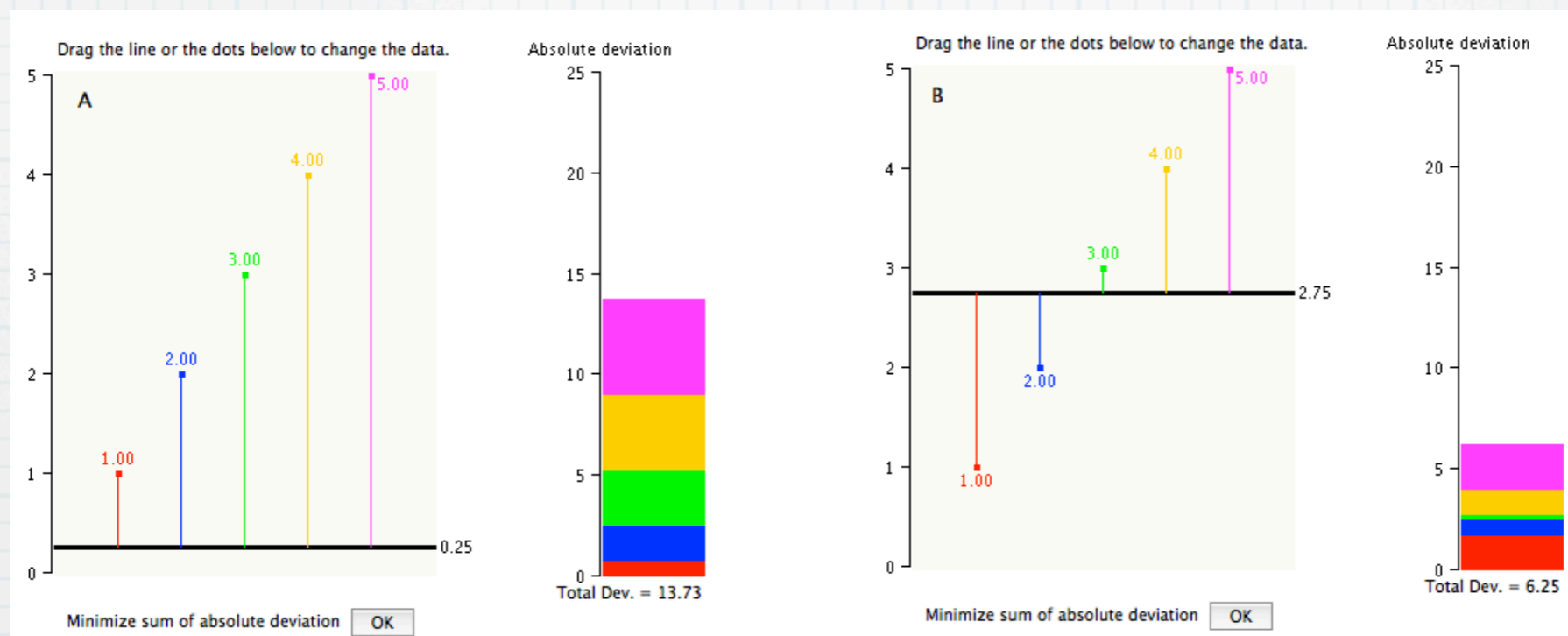
Simulations to Discover Matching Statistics

* Balance Scale (mean)

* Minimize Absolute Differences (median)

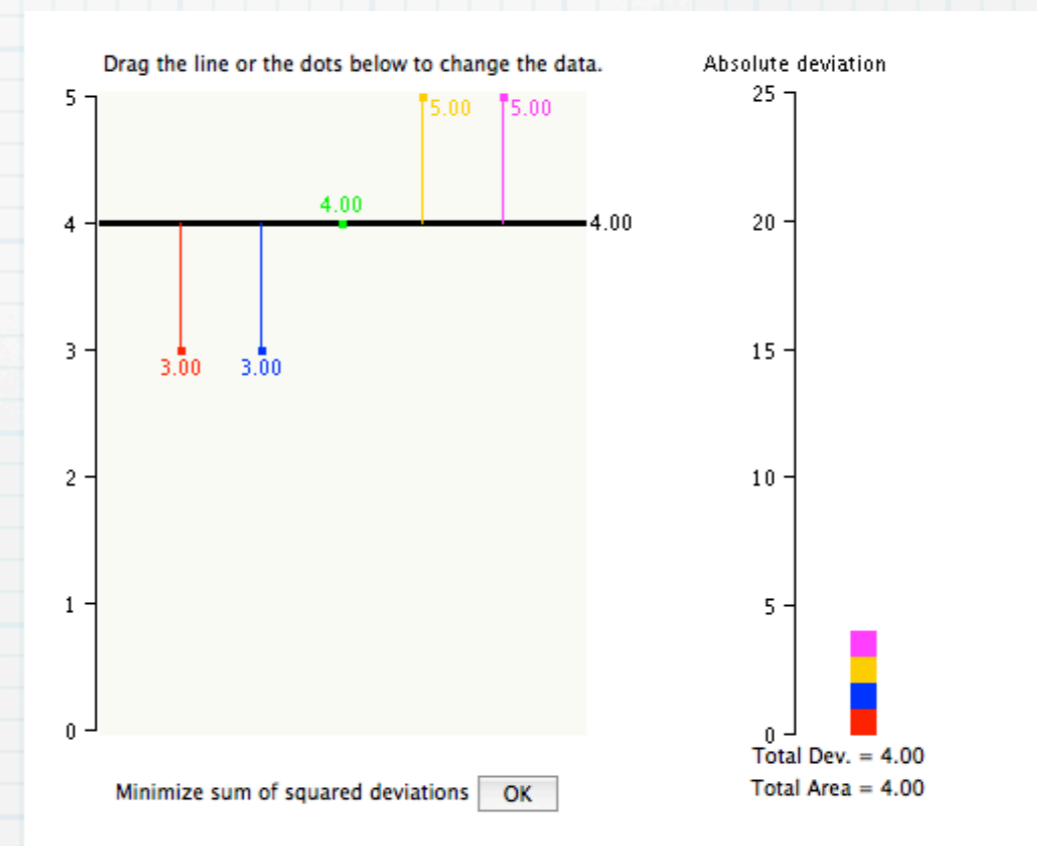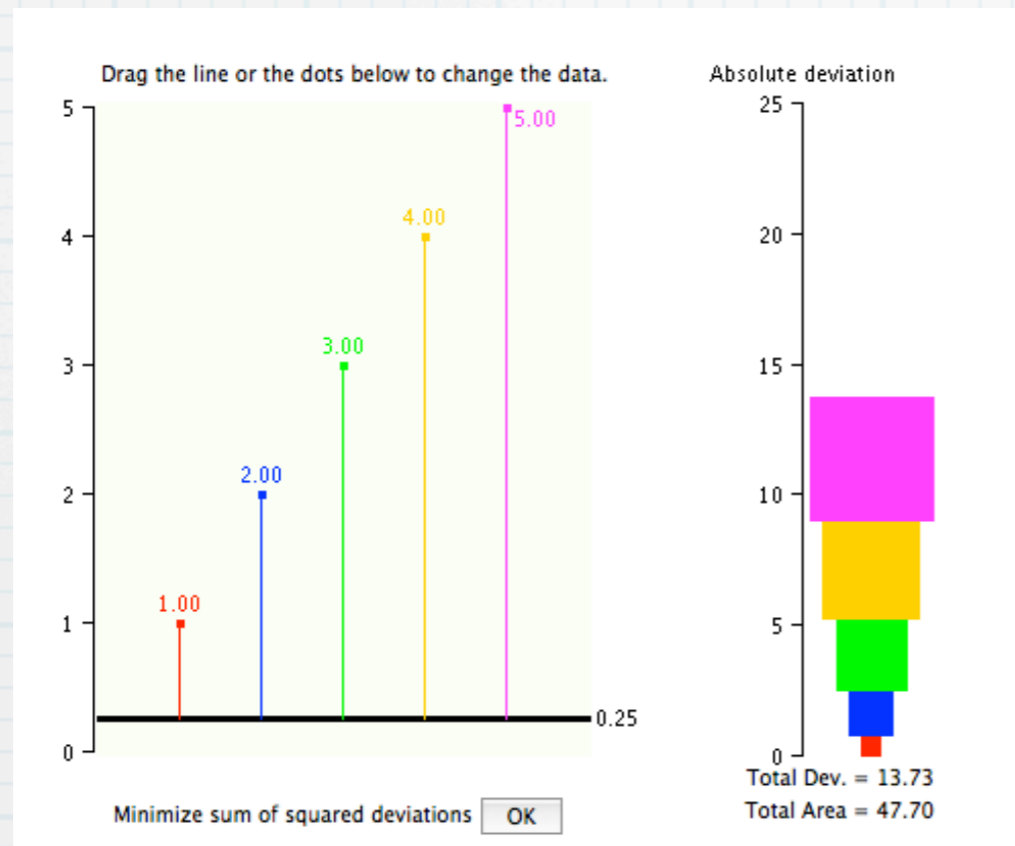* Minimize Squared Differences (mean)

Balance Scale Simulation

Absolute Differences

http://onlinestatbook.com/2/summarizing_distributions/median_sim.html

Squared Differences

Using the "Query First Method"

* Ask students what they expect before they interact with the simulation even if they have to guess (delMas, Garfield, & Chance, 1999).

* In class this works well with Audience response systems.

In Practice

* Used by my Colleague Camille Peres

* students appeared very engaged

* The mode for both the "balance scale" and the "absolute deviations" exercises was 7.

		Effectiveness			Interesting/Enjoyable		
Exercise	N	Mean	Median	Mode	Mean	Median	Mode
balance scale	74	5.39	5.5	7	4.66	4	4
absolute deviations	37	5.03	5	7	4.38	4	4
squared deviations	54	4.83	5	4 and 6	4.45	4	4

Descriptive statistics for the three exercises. Ratings on a 7-point scale from 1 (low) to 7 (high).