# Bob the Brown (and Slightly Gray)*

## A Tale of Magic andChange

*aka Bob delMas, University of Minnesota

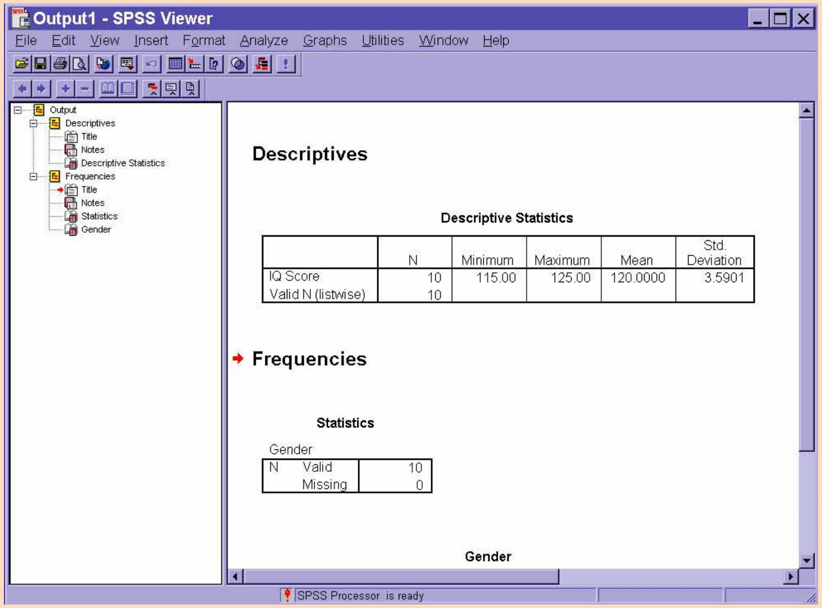
$$E(Y) = \Sigma Y / N$$

$$Var(Y) = \Sigma(Y - \overline{Y})^2 / N$$

$$H_0 : \mu_1 = \mu_2$$

$$P\left(\left(\overline{Y}_j - \overline{Y}_k\right) \geq \left(\overline{Y}_1 - \overline{Y}_2\right) \mid H_0 : \mu_1 = \mu_2\right)$$

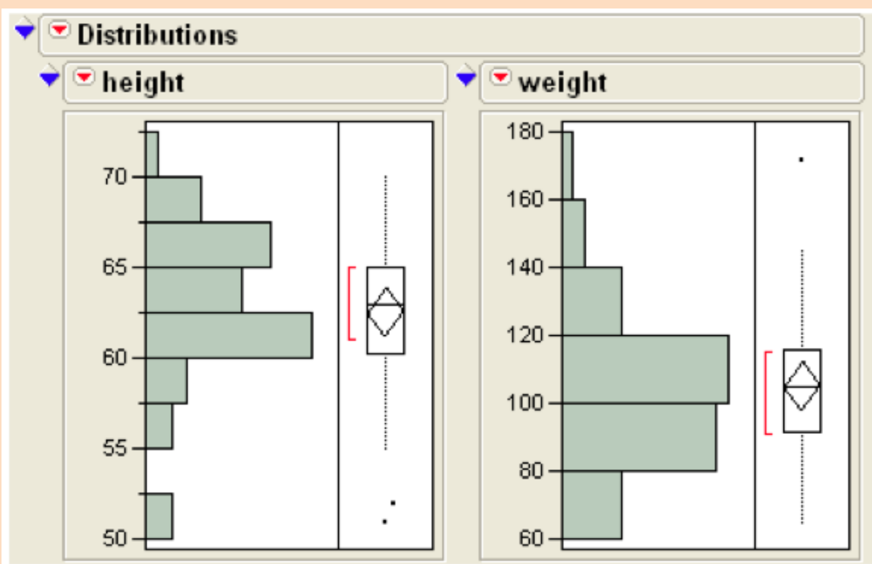
# SPSS



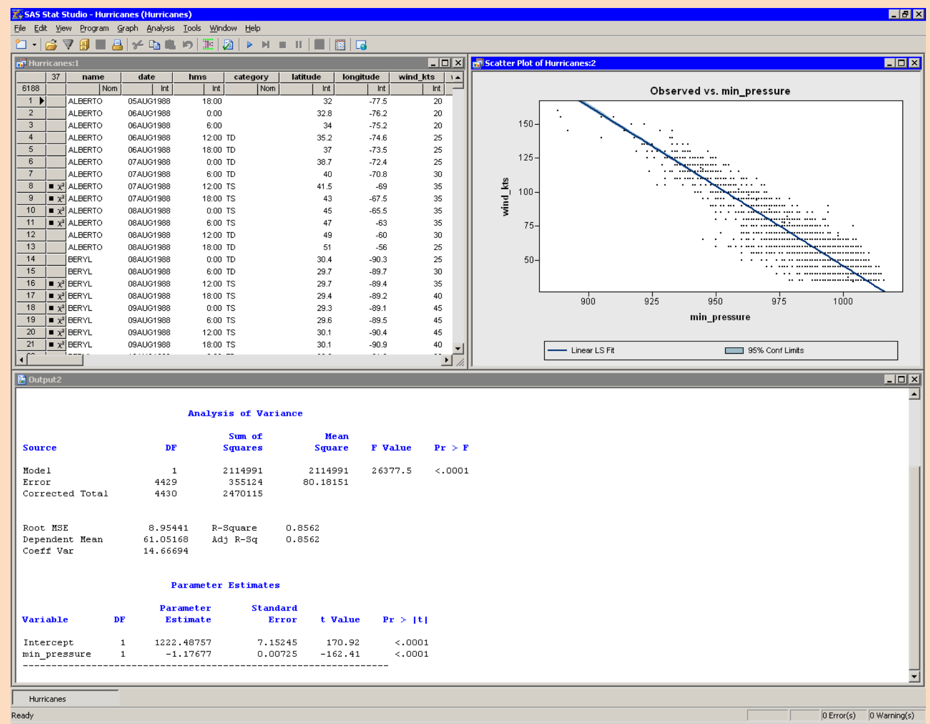

# SAS

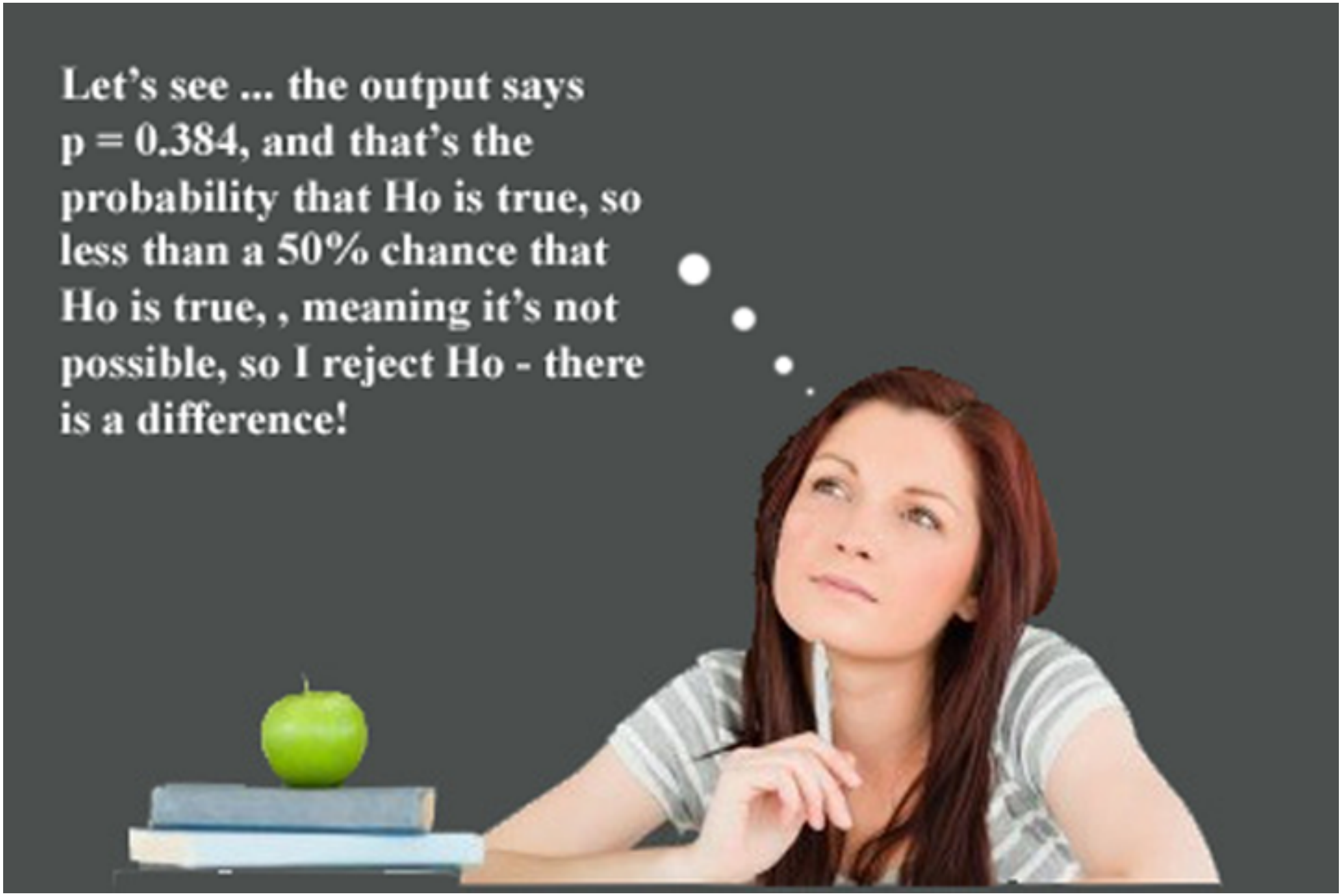
```
proc reg data = "d:\hsb2";
model science = math female socst read / clb;
run;
quit;

The REG Procedure
Model: MODEL1
Dependent Variable: science science score

                         Analysis of Variance

                                Sum of          Mean
Source              DF         Squares        Square    F Value    Pr > F

Model                4      9543.72074    2385.93019      46.69    <.0001
Error              195      9963.77926      51.09630
Corrected Total    199           19507

Root MSE             7.14817    R-Square     0.4892
Dependent Mean      51.85000    Adj R-Sq     0.4788
Coeff Var           13.78624

                         Parameter Estimates

                                             Parameter     Standard
Variable     Label                     DF     Estimate        Error    t Value    Pr > |t|

Intercept    Intercept                  1     12.32529      3.19356       3.86      0.0002
math         math score                 1      0.38931      0.07412       5.25      <.0001
female                                  1     -2.00976      1.02272      -1.97      0.0508
socst        social studies score       1      0.04984      0.06223       0.80      0.4241
read         reading score              1      0.33530      0.07278       4.61      <.0001
```

# JMP

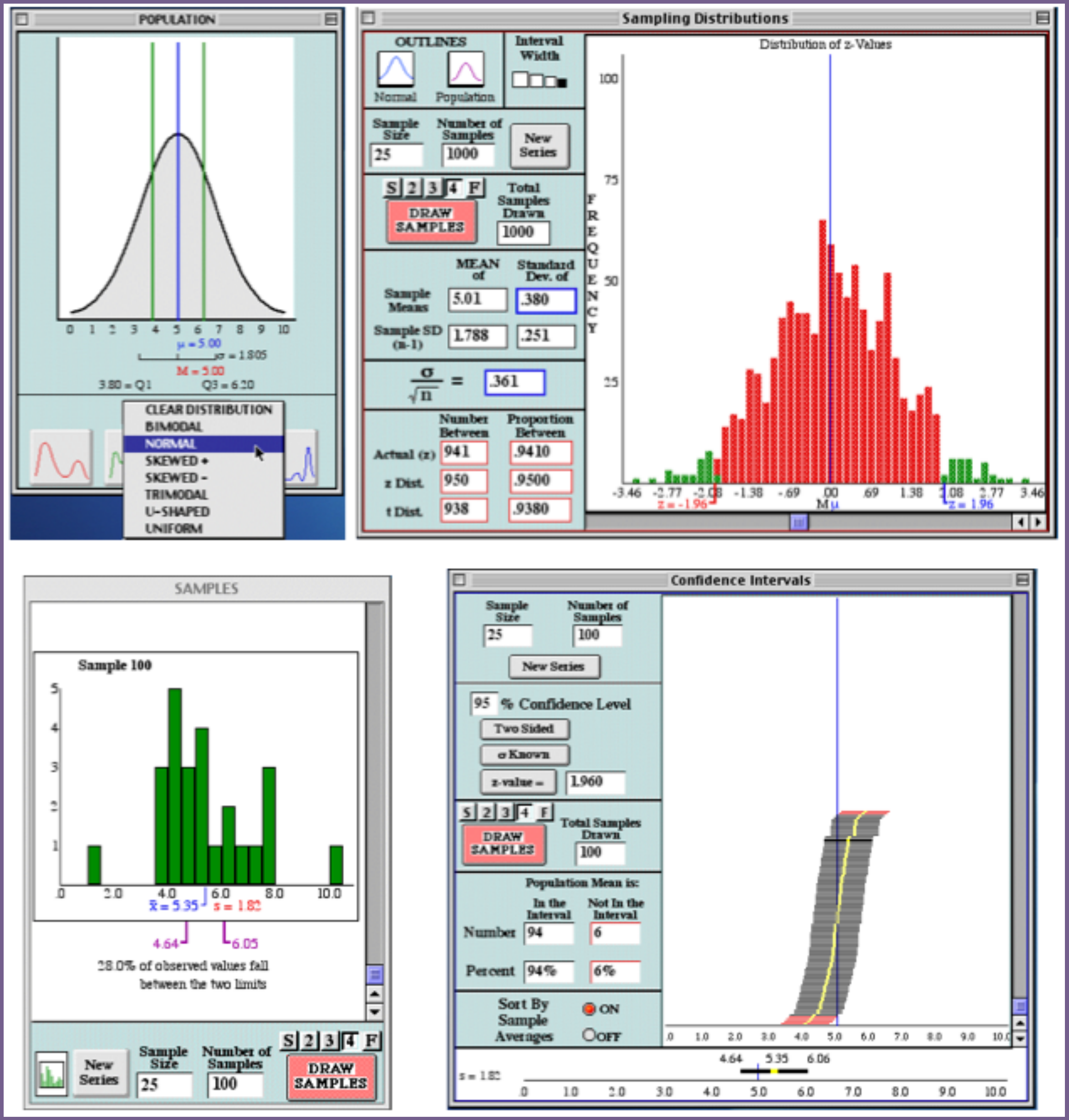



# Minitab

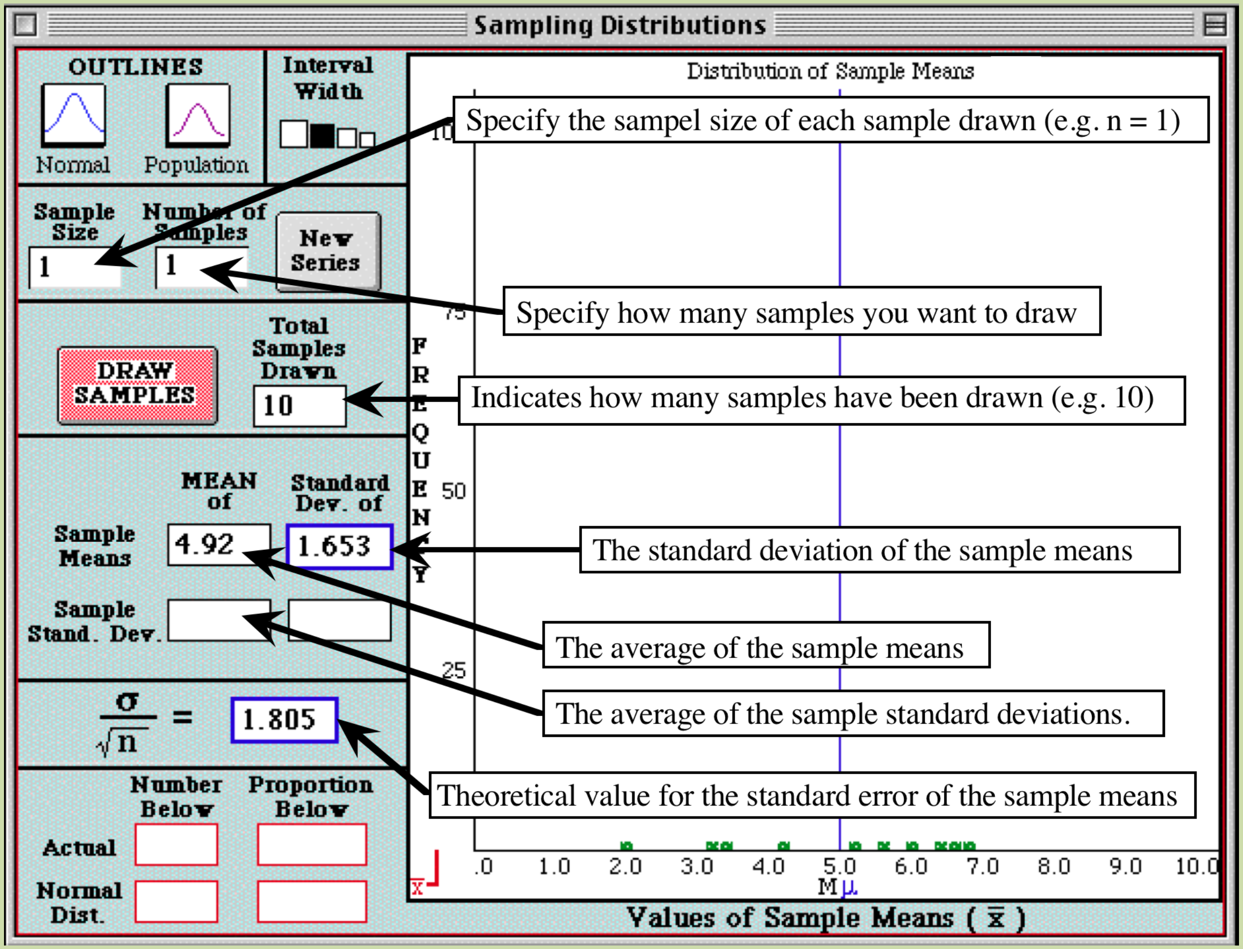


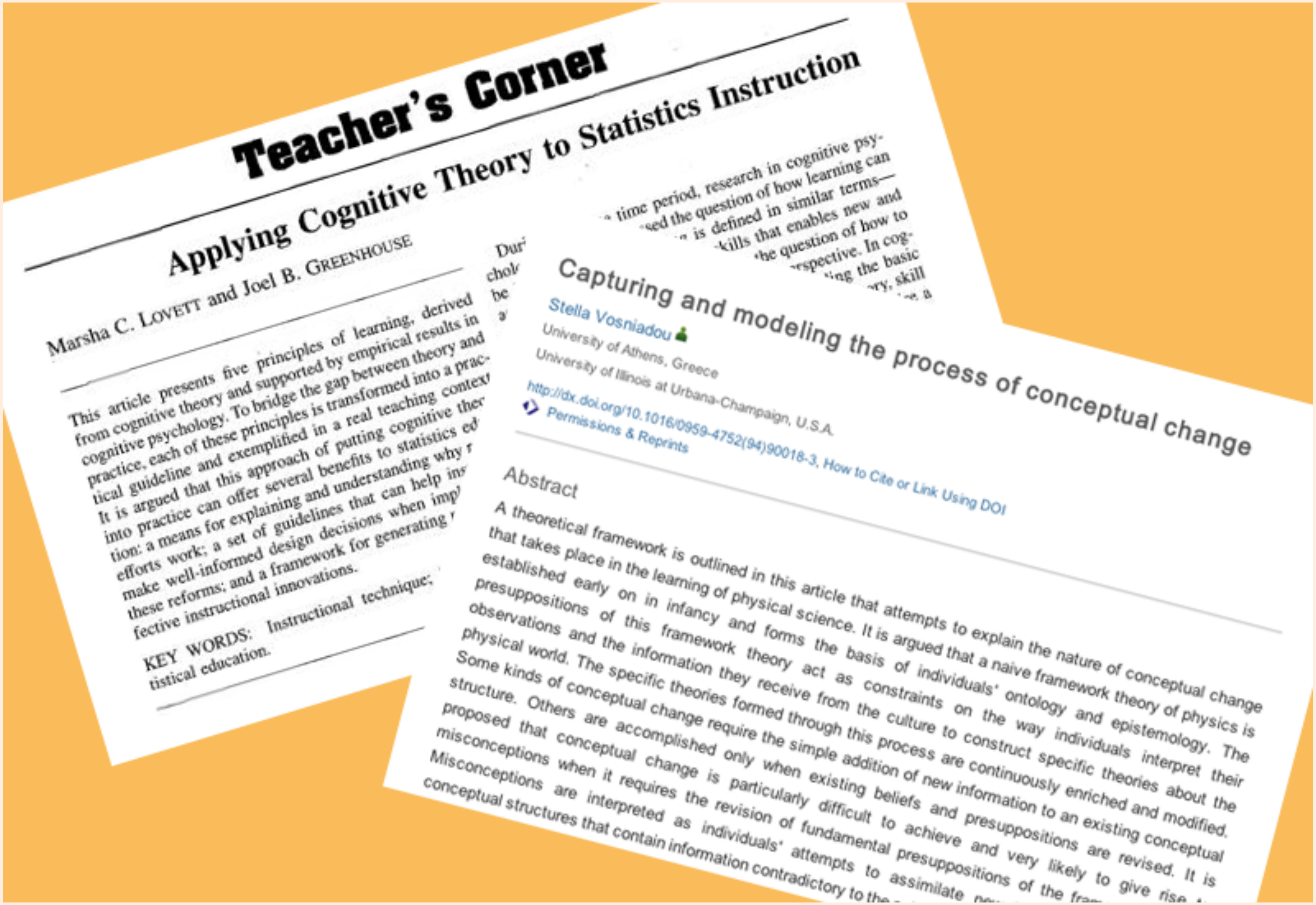

Let's see ... the output says
p = 0.384, and that's the
probability that Ho is true, so
less than a 50% chance that
Ho is true, , meaning it's not
possible, so I reject Ho - there
is a difference!

# Sampling SIM



# Sampling SIM Instructions





# Teacher's Corner

## Applying Cognitive Theory to Statistics Instruction

Marsha C. Lovett and Joel B. Greenhouse

This article presents five principles of learning, derived from cognitive theory and supported by empirical results in cognitive psychology. To bridge the gap between theory and practice, each of these principles is transformed into a practical guideline and exemplified in a real teaching context. It is argued that this approach of putting cognitive theory into practice can offer several benefits to statistics education: a means for explaining and understanding why r... efforts work; a set of guidelines that can help ins... make well-informed design decisions when impl... these reforms; and a framework for generating ... fective instructional innovations.

KEY WORDS: Instructional technique; ... tistical education.

Dur... cholo... be... a...

... time period, research in cognitive psy... ...sed the question of how learning can ... is defined in similar terms— ...kills that enables new and ...he question of how to ...rspective. In cog... ...ing the basic ...ry, skill ...e a

## Capturing and modeling the process of conceptual change

Stella Vosniadou
University of Athens, Greece
University of Illinois at Urbana-Champaign, U.S.A.

http://dx.doi.org/10.1016/0959-4752(94)90018-3, How to Cite or Link Using DOI
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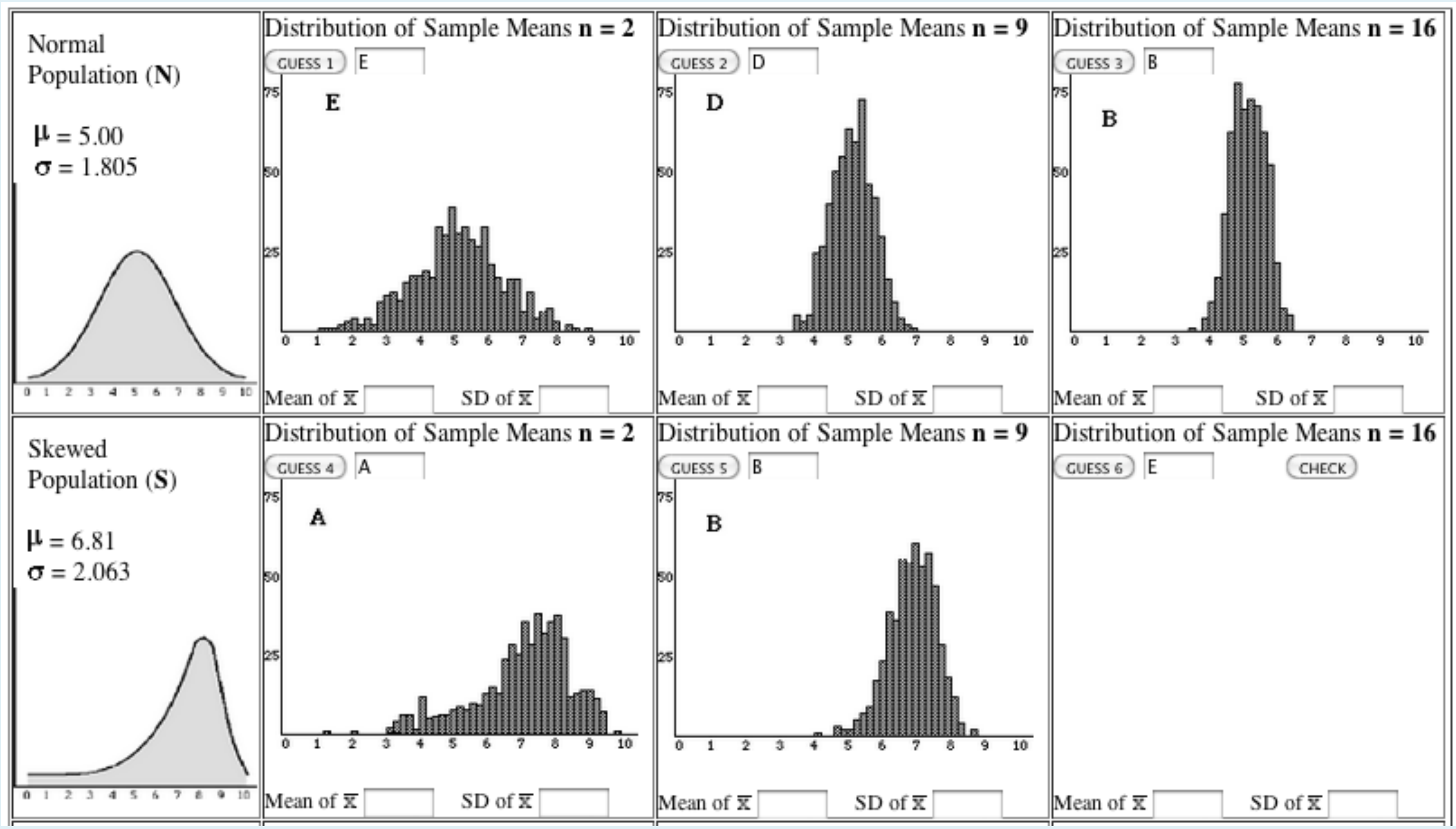
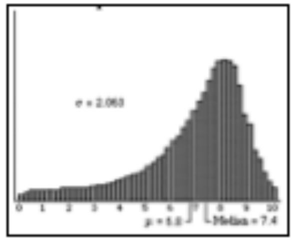
### Abstract

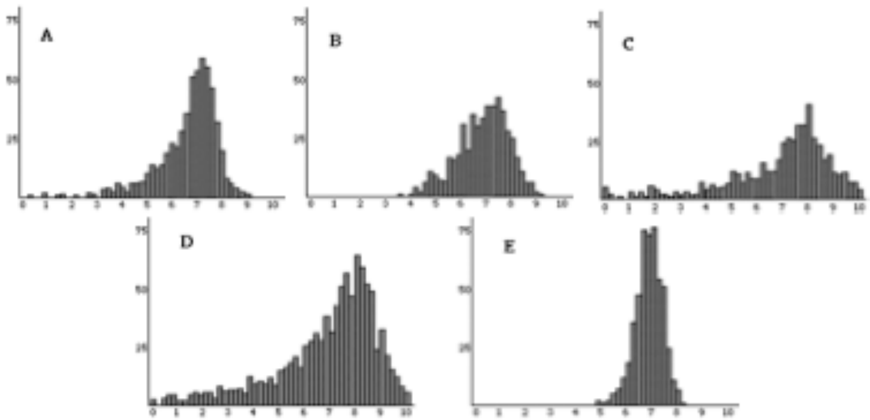
A theoretical framework is outlined in this article that attempts to explain the nature of conceptual change that takes place in the learning of physical science. It is argued that a naive framework theory of physics is established early on in infancy and forms the basis of individuals' ontology and epistemology. The presuppositions of this framework theory act as constraints on the way individuals interpret their observations and the information they receive from the culture to construct specific theories about the physical world. The specific theories formed through this process are continuously enriched and modified. Some kinds of conceptual change require the simple addition of new information to an existing conceptual structure. Others are accomplished only when existing beliefs and presuppositions are revised. It is proposed that conceptual change is particularly difficult to achieve and very likely to give rise ... misconceptions when it requires the revision of fundamental presuppositions of the fram... Misconceptions are interpreted as individuals' attempts to assimilate ne... conceptual structures that contain information contradictory to the ...

# Sampling SIM Scrapbook





Each of the five graphs below labeled A to E represent possible distributions of sample means from random samples drawn from Talia's population.




A distribution of sample means from samples of size n = 16 should look more like the population. I predict the distribution of sample means will look like D.

"I argue that despite broad acceptance and rapid growth in enrollments, the consensus curriculum is still an unwitting prisoner of history...Randomization-based inference makes a direct connection between data production and the logic of inference that deserves to be at the core of every introductory course."

# Modeling and Simulation with TinkerPlots™

# CATALST Course Curriculum

| DAY | ACTIVITY |
| --- | --- |
| Day 1 | ▪ Introduction |
| Day 2 | ▪ Exploring the Behavior of "Random" [iPod Shuffle MEA] |
| Day 3 | ▪ Understanding Human Intuitions about Randomness [Can you beat randomness-part I]<br>▪ Modeling "Random" Behavior [Checking You Intuitions-dice and coins - Add Intuitions HW] |
| Day 4 | ▪ Modeling "Random" Behavior [Checking You Intuitions extend w/count and collect<br>▪ Coins, dice, hw2 scenario |
| Day 5 | ▪ Modeling Complex Phenomena [One Son until boy/one of each, describe model] |
| Day 6 | ▪ Modeling "Blind Guessing" [Matching Dogs w/o replacement, match, counter, describe model, and trial] |
| Day7 | ▪ Modeling Variation for a Statistic Based on "Blind Guessing" [Helper / Hinderer, remove p-value, likely/unlikely, conditional on model] |
| Day 8 | ▪ Introduction to Randomization Tests [Memorizing Letters] |
| Day 9 | ▪ Randomization Tests [Sleep Deprivation] |
| Day 10 | ▪ Designing Experiments: Role of Random Assignment Tests [Shoe Strength] |

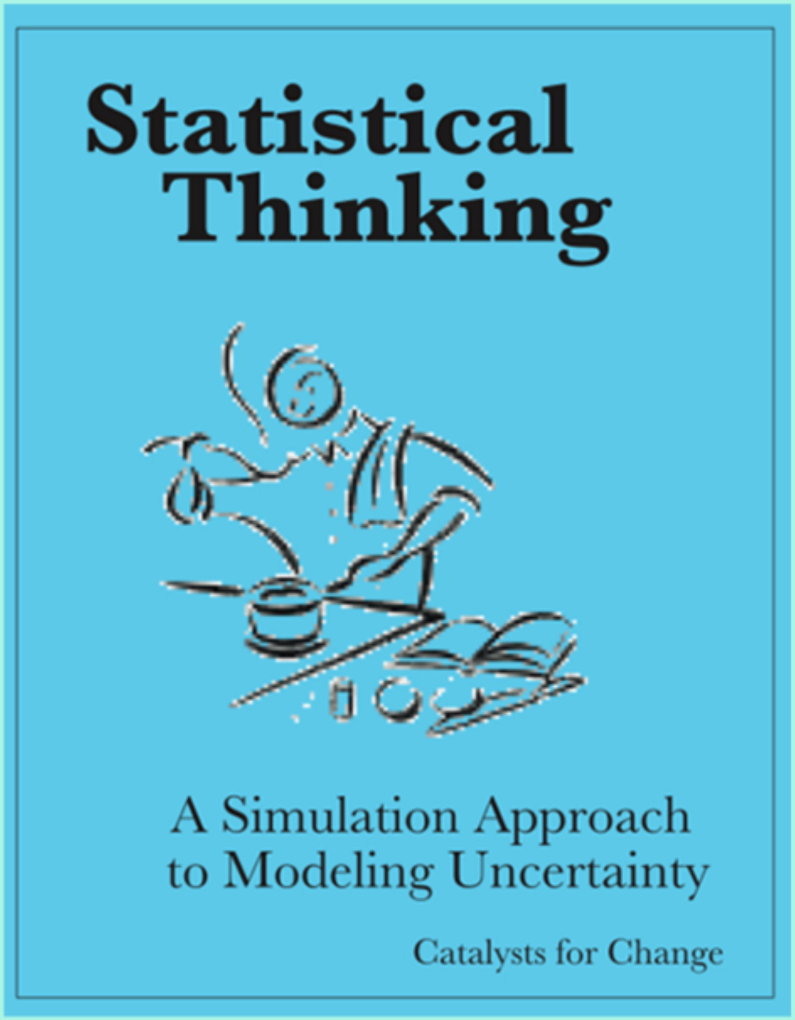
# Sleep Deprivation Study

Researchers have established that sleep deprivation has a harmful effect on visual learning. But do these effects linger for several days, or can a person "make up" for sleep deprivation by getting a full night's sleep in subsequent nights?

A recent study (Stickgold, James, and Hobson, 2000) investigated this question by randomly assigning 21 subjects (volunteers between the ages of 18 and 25) to one of two groups: one group was deprived of sleep on the night following training and pre-testing with a visual discrimination task, and the other group was permitted unrestricted sleep on that first night. Both groups were then allowed as much sleep as they wanted on the following two nights. All subjects were then re-tested on the third day.

Does the effect of sleep deprivation last, or can a person "make up" for sleep deprivation by getting a full night's sleep in subsequent nights?

Subjects' performance on the test was recorded as the minimum time (in milliseconds) between stimuli appearing on a computer screen for which they could accurately report what they had seen on the screen. The sorted data and plots presented here are the improvements in those reporting times between the pre-test and post-test (a negative value indicates a decrease in performance):




WARNING

BLATANT AND UNABASHED PROMOTION OF A TEXTBOOK


We demand an Alternative to Alternative Distributions
Care About Chi-Square
Stop the Madness
I'm Sick of Sigma
We're Peeved about p-Values
Bernoulli is Unruly
The Poison Distribution Makes Me Sick
Null Distributions Are Dull Distributions
No Confidence in Confidence Intervals

# WARNING

BLATANT AND UNABASHED
PROMOTION OF A BREAKOUT SESSION

Breakout Session #2C (Hope)
Friday
3:00-4:15pm
*Evaluating the Impact of Change in Curriculum and Teaching*


THE END.