Focus on ST311, Introduction to Statistics

Hewlett Continuation: Spring 2001

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Background: Calif. State University, Northridge

- Ethnically diverse student population
- High percentage of students requiring remediation
- Department of Mathematics, Developmental Mathematics Program (serving over 4500 students each year)

Background: NC State University

- Lab Instructor, ST512 Statistical Methods
- Preparing the Professoriate: ST101H, Dr. Bill Swallow

The Chronicle of Higher Education (1/19/2001)

“Loving Math Infinitely”
Dr. Josefina Alvarez, Professor of Math
New Mexico State University

- Mathematics Appreciation course
- Audience = Disgruntled Nonscience Majors
- 25 years of experience → no help!
- Solution:
  - Use their language
  - Convey the applicability of mathematics to their interests

ST311, Introduction to Statistics

- Introductory service course for non-majors, no prerequisites
- About 10 sections offered each semester (n=65)
- Diverse audience (math abilities and class standing)
- Aim for the middle
- Objective: Provide an overview of statistical thinking, basic theory, and techniques.
Goals for the Instructor

- Create a comfortable environment.
- Whenever possible, use their language.
- Convey the applicability of statistics to their interests.

Create a comfortable environment

Target Outcomes: Habit of Inquiry, Critical Thinking

- Big class size → try to make it smaller (instructor is the key)
- Encourage questions, reward the questioner
  “Do you have any questions?” → “What questions do you have for me today?”
- Take all responses from the audience, unless especially if it is wrong.
  “This part is a little tricky, but it’s doable.”
- Provide anonymous surveys during the semester.

Whenever possible, use their language

Target Outcome: Help students think in relative terms.

Using Analogies
- Jaime Escalante, Stand and Deliver
- Developmental Math Program → Graduate Students
- Example: The Normal Distribution

The Normal Distribution

The normal distribution is a family of “bell shaped” density curves where a particular normal density is uniquely specified by both its mean (μ) and its standard deviation (σ). The mean specifies the center of the density and the standard deviation specifies its spread. All densities have the same overall shape.
The Normal Distribution

The normal distribution is a family of density curves that are "bell shaped".

All normal curves have the same overall shape.

An Aside: From Geometry — Rectangles

Rectangles are 4 sided figures with the special property that all sides meet at right angles — opposite sides have equal length.

For the family of rectangles, we can think of many examples:

All rectangles have the same overall shape.

Note: 2 pieces of information are needed to describe a particular rectangle:

1.) The Length (l)
2.) The Width (w)

Specifying only one of these is not enough — we need both quantities.

As we’ve seen, when we think of the family of normal curves there are many examples. To describe a particular normal curve, as with rectangles, we need 2 pieces of information:

1.) The Mean (\(\mu\))
2.) The Standard Deviation (\(\sigma\))

Specifying only one of these is not enough!

\(\mu\) specifies the location of center of the normal curve.
\(\sigma\) specifies the spread of the normal curve.

- A good analogy can help dispel any mystery that may lurk behind a new concept.
- This should help pave the road to “doability”.

Convey the applicability of statistics to their interests.

Target Outcome: Instill a vested interest on a personal level.

Statistical Time Outs

- “How is statistics useful for me?”
- Involve students by using their data.
- Examples are based upon represented majors.
- Analysis on such data is much more interesting for them.

Free Lunch!
**Statistical Time Out Topics**

- Biological Sciences ⇒ Comparison of Varieties of Corn
- Sociology ⇒ Seeking Correlations in Personal Relationships
- Public Health ⇒ Proportion of Illegal Drug Usage Among Class Members
- Mathematics ⇒ Probability and the Birthday Problem
- Criminology ⇒ DNA Forensics and Statistical Genetics
- Ethics ⇒ ‘Sham’ Surgery of Clinical Trials, Research Cover-ups
- English/History ⇒ Statistical Analysis of Disputed Authorship

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**Conclusion**

- Lots to improve upon, plenty of room to grow
- Many positive ideas (*almost too many*) both from the Hewlett gatherings and PTP experiences
- *Statistical Time Out*

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**Additional comments: (Survey 1, Spring 2001)**

“Interesting course, lot to talk about, I normally hate math, but this is cool. Sorry I missed like 2 days of class, I was sick and I was really tired.”