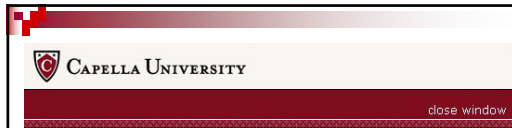## Statistical Literacy: Common Challenges

Presented by: Marc Isaacson

email: isaacson@augsburg.edu

Augsburg College (Minneapolis, MN)

ASA JSM – Statistical Literacy

August 2006
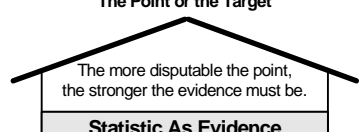

C CAPELLA UNIVERSITY

close window

General Education - BS
MAT2050 Statistical Literacy

This course concentrates on the application of critical thinking skills to arguments involving statistics. Emphasis is placed on the learner as a consumer of statistics rather than a producer of statistical calculations. Course activities focus on the interpretation, evaluation, and communication of real-world situations and news stories.

3 credit(s)

Statistical Literacy

The Point or the Target

The more disputable the point, the stronger the evidence must be.

Statistic As Evidence

"All Statistics are Socially Constructed"
So, "Take CARE"!!
Statistics may be influenced by:

C Confounding	A Assembly	R Randomness	E Error

Course Components

- Presentations
- Textbook Readings
- Asynchronous Discussions
- Article Evaluations
- Course Project
  - (3 Tier Argument Evaluation)
- Online Statement Evaluator Activity
- Homework Assignments
- Online Quizzes

Common Challenges / Misconceptions?

- "MAT 2050 should be an easy class"
  - Truths:
    - Less emphasis on formulas / calculations
      - "Stat-Lite" Impression
    - Grounded in everyday occurrences of statistics
      - Less data exposure
    - 3 Quarter Credit Format

Common Challenges / Misconceptions?

Reality
  - Hypothetical Thinking
  - Reading and Writing
    - Evaluating arguments involving statistics
    - Ratios and Percentages
    - Written project papers
  - Unique Pedagogy

Hypothetical Thinking

- Essential skill for the Statistically Literate
  - Ability to think beyond the information presented
  - Envision what might have occurred
  - Translate the impact on statistical results
  - High level of thinking

- Under-developed Skill in Learners
  - Not encouraged in other academic courses
  - Challenging for Learners and Instructor
  - Can be taught and developed

Instances of Hypothetical Thinking

- Recall the "Take CARE" acronym

  - Confounders / Alternate Explanations
  - Assembly
  - Randomness
  - Error / Bias

- **Starbucks to Boost Coffee Prices in U.S.**
  (09/28/04 Associated Press)

- You'll soon be forking up an extra dime and a penny for a gentrified java. Starbucks Corp. said it would raise the average price of its beverages by 11 cents at 4,500 stores in North America because of increases in the cost of coffee and sugar.

  In its announcement Monday, the company did not reveal what the average price of individual beverages would be after the increase Oct. 6. Currently, a 12-ounce Starbucks latte ranges from $2.25 in Minnesota to $3 in New York City.

  The price hike - the first since August 2000 - will amount to an estimated 3 percent for all the company's drinks, Smith Barney analyst Mark Kalinowski said.

  The company had announced previously that it would raise prices by the end of the year, saying coffee prices have risen 36 percent and sugar prices 39 percent in the past year.

Starbucks Article Example

- If the average price in NYC is $3.00 for a latte, what percentage increase is 11 cents?

  - 15% Incorrect (n=46)

- If the average price in MN is $2.25 for a latte, what percentage increase is 11 cents?

  - 17% Incorrect (n=46)

Starbucks Article Example

- Calculate the Mean of the Coffee Prices

  - 15% Incorrect (n=46)

- Calculate the Median of the Coffee Prices

  - 24% Incorrect (n=46)

- Calculate the Mode of the Coffee Prices

  - 13% Incorrect (n=46)

Starbucks Article – Hypothetical Thinking

- Is it possible that some prices could be lowered? If so, how?

  - 37% Incorrect (n=46)

- If the increase in prices is 3%, as stated in the article (which equals 11 cents), what is the average price of a drink at Starbucks?

  - 50% Incorrect (n=46)

- Given the following four menu item prices, produce three different examples of price changes that each result in an average 11 cent increase.

  - 59% Incorrect (n=46)

Awareness

- "I will definitely look at statistics in a different way after taking this class, especially reading them in magazines or newspapers. I will not be so naïve in believing everything that I read, and understand that some of the important facts could be missing in the story."

Ratios and Percentages

- Overview
  - Simple Math
    - Simple Difference
    - Simple Ratio
    - Relative Difference

  - Difficult in Context
    - Reading Tables and Graphs
    - Writing Correct Statements
      - Descriptions
      - Comparisons

Ratios and Comparisons

True or false: Six is 300% more than two.

a. True

b. False   24% Incorrect (25 of 104 students)

c. Can't tell

The figure 300% is incorrect in this statement. The correct comparison should be (6-2)/2 = 200% more than two.

Ratios and Percentages

Select the correct statement from the selections below when you compare 8 with 2 as a simple ratio. Use the smaller as the base.

a. 8 is 4 times more than 2

b. 8 is 3 times as much as 2   75% Incorrect (78 of 104 students)

c. 8 is 400% more than 2

d. 8 is 6 percentage points more than 2

e. None of the above

The correct comparison statement as a simple ratio would be 8 is four times as much as 2.

Unique Pedagogy

- Full Immersion from beginning
  - "Take CARE" framework
  - Focus on Association vs Causation
  - Evaluating Articles in week 1
  - Worksheet / Checklist Format

Challenging

- "Even though I an NOT a math wiz, nor do I even like math, I do have to admit that I find what we have been learning to be quite fascinating. I now try to figure out the meaning of studies that I hear and read about on the news and newspapers. I still find some of the concepts to be extremely challenging, but I will just keep plugging along."

- "I have to admit, that I took this course to fulfill the math credits I need. I didn't really realize how important statistical literacy is until I took this course. Even though I really don't like math, I may consider another statistics course just to get full understanding and better skilled."

Conclusions

- Statistical Literacy is an academically challenging course which provides students with skills required by today's media driven world.

- A far greater percentage of your students will go on to become consumers of statistics rather than producers. Shouldn't they be properly educated in statistical literacy?