Teaching Statistical Literacy as a Quantitative Rhetoric Course

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Statistical Literacy Defined

"**Statistical literacy** is the ability to read and interpret summary statistics in the everyday media: in graphs, tables, statements, surveys and studies.

Statistical literacy is needed by data consumers – students in non-quantitative majors: majors with no quantitative requirement such as political science, history, English, primary education, communications, music, art and philosophy.

About 40% of all US college students graduating in 2003 had non-quantitative majors."   ~ Milo Schield in "Assessing Statistical Literacy: Take CARE"

Definition of Rhetoric and Quantitative Rhetoric

- According to Aristotle, rhetoric is "the ability, in each particular case, to see the available means of persuasion"

- Quantitative rhetoric is the use of statistical and numerical information in discourse to effect persuasive appeals

Essential Statistical Information Included in the Course

Students in GST 200 are responsible for acquiring and understanding the following statistical concepts:

- Normal Distributions
- Skewed Distributions
- Measures of Center
- Standard Deviation
- Correlation Coefficients
- Percentages, Percentiles, Ratios

What We Expect from Students

At the foundational skill level, students are able to know and apply:

- Mathematical Relationships – graphical, symbolic and numerical representations; proportions, percents, estimation
- Statistical Relationships – data analysis (including graphical analysis), elementary probability
- Algebraic Relationships – modeling, functions, algebraic representations
- Logical Analysis – deductive reasoning, fallacies, arguments, counter examples

What We Expect from Students, Cont'd.

At the application project skill level, students are able to:

- recognize implicit and explicit quantitative claims in discourse and evaluate and test such claims critically
- pose quantitative questions (i.e., student-generated versus instructor-generated questions)
- make and communicate reasoned choices as to applicable quantitative methods for the questions/hypotheses posed and the data considered
- apply quantitative methods to quantitative information (i.e., to student generated data and/or existing data)
- use the results of applying quantitative methods to reason and articulate answers/conclusions to the questions/hypotheses posed

Five Goals of the Course:

○ Learn fundamental concepts and methods of statistics

○ Understand the appropriate uses of statistics as evidence within arguments

○ Recognize inconsistent, inappropriate, or inaccurate use of statistics in quantitative reasoning

○ Understand rhetorical applications of statistics

○ Accurately decode representations of quantitative information in natural language

Course Objectives

By the end of the course:

○ Students will understand the uses of and be able to calculate common statistical measures

○ Students will understand appropriate uses for various statistical measures

○ Students will recognize both valid and fallacious uses of statistical information in rhetorical contexts

○ Students will construct organized essays

○ Students will understand rhetorical appropriateness

Background for Experiments and Studies

In order to understand the origins and derivation of statistical information, students in GST 200 must become familiar with the following essentials of research methods:

○ Observational study designs (longitudinal, cross-sectional, controlled)

○ Experimental Designs (controlled/uncontrolled, single-blind/double-blind)

○ Sampling (random, convenience, scientific)

○ Significance (Statistical significance, margin of error, confidence intervals)

Take CARE: An Analytical Framework

The CARE Mnemonic

○ Context (alternative explanations: common causes and confounders)

○ Assembly (non-statistically systematic choices of definitions or presentation)

○ Randomness (including luck and coincidence)

○ Error, bias (statistically systematic deviations from the actual)

Course Activities

For the sake of providing context and practice in the use of statistical information, students in this course participate in a number of activities:

○ Issue analyses: medical risks, crime statistics, traffic accidents, economic issues (unemployment, health care, the recession), impacts of education, incarceration statistics, etc.

○ Research and investigation: For example, an investigation of intelligence testing: definition of "intelligence quotient"; IQ testing; commentary on Herrnstein and Murray's *The Bell Curve*; association of "intelligence" with social class, race, SES; etc.

○ Online discussion forums: using both the course Moodle site and odysseys2sense.com

Odysseys: Students Subjecting their Ideas to Public Scrutiny

○ Points are given for participation

○ Responses to questions and to other participant responses are rated by the participants

○ A 2-4 scale assigns the value of the response

   ○ 2 for an acceptable answer (actually answering the questions)

   ○ 3 for elaborating on, explaining, or justifying the answer

   ○ 4 for asking an extension question ("Why...", "What do we mean by...", "What if...", etc.) or making a good connection to an idea from class or somewhere else.

Odysseys: "Games of lively civil discourse"

The criteria for critiquing forum responses are:

- F: Factual, accurate; you agree with the rating it gives, it's on the topic, etc.

- T: Thought-provoking, helpful; it generates good thinking

- C: Civil; it does not use put-downs, insults, etc.

Rhetorical Analysis Essay Guidelines

In this brief (2-page) essay you will look at the ways in which a contemporary issue is depicted statistically. For now, your attention should be directed toward the argument itself--especially its conclusion and premises--rather than to specific statistical information. To set up your analysis, you will want to describe each of the following:

- The context for the argument (public policy decisions concerning the legality of cell phone use by drivers)
- The ways in which categories are constructed (automobile accidents caused by 'distracted drivers' using cell phones)
- The selection of data to be used as evidence (visual observation of drivers talking on cell phones while stopped at traffic signs)
- Possible sources of error in the construction of data (eye-witness accounts vs. police observations)

Final Projects for the Course

Guidelines for the final project:

- Identify an issue that is informed by quantitative information, and explain what it is that you hope to discover through your review of these statistical data.
- Use Microsoft Excel to sort data and perform the calculations necessary for your analysis. These might include measures of central tendency (mean, median, mode), standard deviation, correlation coefficients, etc.
- Make appropriate comparisons wherever possible, using counts, percentages, and/or ratios
- Use tables and graphs as you deem necessary to present your data
- State your argument and explain how it follows from this analysis of your data.
- Provide a link or a reference to the data set that you are using for your analysis.