



Course Overview
Speaking With Numbers: The Effective Use of Statistics

General Class Information

Instructor Name and Contact Information:

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Subject Area and Catalog Number:

Subject: ISBU / ISSS
Catalog Number: 4420

Year and Term:

Summer 2016 (Term 1166)

Class Title:

Speaking with Numbers: The Effective Use of Statistics

Level:

Undergraduate

Class Description (SIS 400 catalog description):

Provides a basis for evaluating the claims of others while also choosing the best analysis methods for supporting ideas. Examines how quantitative analysis can inform decisions, how to select the appropriate tools for the situation, how to interpret the results, and how to effectively communicate the results.

Required Text:

Professor will provide various readings and course materials.

Suggested Texts:

The 5 Elements of Effective Thinking (Burger & Starbird)
Innumeracy (Paulos)
Beyond Numeracy (Paulos)
Thinking & Reasoning with Data & Chance (NCTM)
Data & Probability Connections (Perkowski)

Course Goals:

After successfully completing this course, students should be able to:

- Deepen their content knowledge understanding of mathematics and data analysis
- Communicate mathematical ideas orally and in writing
- Develop confidence and enthusiasm for quantitative analysis
- Develop understanding of probability and statistics concepts relevant to everyday life
- Create and analyze graphical representations of statistical concepts (including the normal distribution)
- Solve probability and statistics problems using computational and 'hands on' methods
- Represent & explain elementary probability and statistics concepts using various strategies
- Use appropriate educational technology as both a teaching and learning tool

Learning Outcomes:

After successfully completing this course, students will demonstrate the following KNOWLEDGE by being able to:

1. define what is meant by descriptive statistics, inferential statistics, a population, and a sample.
2. define the following different types of variables and data: qualitative, quantitative, discrete and continuous.
3. compute the five-number summary and the interquartile range of a data set.
4. define the following basic terms and concepts relating to probability: experiment, outcome, sample space, complement of an event, union and intersection of events.
5. distinguish between the theoretical ("equal-likelihood") method and the empirical ("relative-frequency") method of assigning probabilities to the outcomes and events in a sample space.
6. describe the basic properties of the normal distribution and the normal curve.

After successfully completing this course, students will demonstrate the following SKILLS by being able to:

1. determine whether a given statistical situation involves descriptive or inferential statistics.
2. determine whether a given type of data is qualitative or quantitative, and if quantitative, whether it is discrete or continuous.
3. construct (by hand or using a graphing calculator, MINITAB or EXCEL, as appropriate) the following graphical representations of data sets: frequency histogram, dotplot, stem-and-leaf diagram, box-and-whisker diagram, bar graph, pie chart, scatterplot.
4. calculate (by hand or using a graphing calculator, MINITAB or EXCEL, as appropriate) the measures of central tendency (mean, mode, median) and spread (range, variance standard deviation) of a data set.
5. calculate the sample z-score of an observation in a data set.
6. calculate (by hand or using a graphing calculator, MINITAB or EXCEL, as appropriate) the five-number summary and interquartile range of a data set.
7. calculate the probabilities of outcomes and events in a sample space using the "f/N" rule.
8. calculate (by hand or using a graphing calculator, MINITAB or EXCEL, as appropriate) regression and correlation coefficients between two variables of a bivariate data set.

After successfully completing this course, students will demonstrate the following ABILITIES by being able to:

1. choose an appropriate technique to create a meaningful graphical representation of a set of data.

2. critically examine statistical graphs and recognize the ways in which they can sometimes be misleading.
3. choose an appropriate set of descriptive measures (measure of center and spread) of a set of data, given information about the distribution of the data.
4. compare and contrast the relative standing of observations in different data sets with z-scores.
5. correctly interpret the value of the linear correlation and use the linear regression equation to summarize the appearance of the related scatter diagram and make predictions.
6. choose the appropriate probability rule(s) to find the probability of a given event in a sample space, using one's knowledge of probability rules and one's ability to express verbal descriptions of events in symbolic form.
7. critically examine statistical calculations and assess their accuracy and reasonableness.

Assessment Components:

Assignments will take on a wide variety of forms and formats. Exercises from the class materials or the professor will be recommended for most of the topics and concepts. Assessments will vary but may include written exams, group and individual projects, class activities, outside-of-class assignments, written assignments, and class presentations. All assignments will have specific due dates. Work is due at the beginning of class on the date it is due. Late work may not be accepted or may incur penalties. Work **may** be turned in early if you are going to be absent from class on the day it is due.

Delivery Mode Expectations:

We will meet in person on all scheduled class dates. We will utilize UVaCollab for online discussions, assignments, and resource / document storage.

Required Technical Resources and Technical Components:

CALCULATOR: TI-83 /84 + Graphing Calculator

SOFTWARE: Microsoft Excel or Numbers

TOOLS: Each student will need a flash-drive to save course material from UVaCollab, a set of basic tools (notebooks, pen / pencil, ruler, ...), and access to a computer with Internet access for web-based assignments and E-mail.

OTHER: Students are responsible for checking the ANNOUNCEMENTS and ASSIGNMENTS in UVaCollab in advance of each class period. Also, students are responsible for downloading all needed course documents from UVaCollab, printing them before class, and knowing the information contained therein.