DPLS 722 Quantitative Data Analysis

Summer 2011 3 Credits

Catalog Description
Quantitative data analyses require the use of statistics (descriptive and inferential) to summarize data collected, to make comparisons of data sets, and to generalize results obtained from samples back to the populations from which the sample were drawn. Knowledge about statistics and statistical analysis can help a researcher interpret data for the purpose of providing meaningful insights about the problem being investigated.

Prerequisite: DPLS 720. 3 credits
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Class Logistics
Meeting place: Room 4th Floor
Meeting time: Thursdays
Meeting Dates: 6/23, 6/30, 7/7, 7/14, 7/21, 7/22, 7/28
Lab Dates: 6/24, 7/1, 7/8, 7/15, 7/29 (see below)

Course Overview
This course will explore the landscape of statistics, statistical thinking, and the analysis of phenomena using statistical method(s). We will begin the course with a very brief theoretical, conceptual, and discursive look at post-positivist epistemology and quantitative methodology. This beginning part of the conversation will also contrast quantitative methodology with qualitative methodology and explore the ‘scientific method' and the development and use of research hypotheses. You will note that there is a considerable amount of reading for the first few classes. I recommend that you get an early start and begin to study these chapters well before the first meeting.

The emphasis in this course will be on statistics and selected methods of using statistics to make inferences and judgments about phenomena. Resources will be available on Blackboard. Class time, lab time, and instructor led conversation will focus on the meaning and understanding of key concepts with the expectation that students will work on practice sets and reading on their own. Specific practice or application of those concepts (methods) will be carried out in group and individual projects.

The focus on this course is on understanding.

The mathematical and logical foundations of statistical concepts will be explored in a concrete and elementary way. It is hoped that this basic understanding will support the ability of students to make sense of statistics in both theoretical and practical terms.
The purpose of this course is to prepare doctoral students and candidates for the task of creating good solid research based on a quantitative methodology.

The goals & objectives of this course are to:

- Understand and apply appropriate conceptual frames to positivist, post-positivist[1], and mixed methods research discourse.
- Relate, understand, and apply post-positivist methodology to research questions relevant to leadership studies.
- Demonstrate a solid understanding of basic statistics through reading, talking, and writing about core statistical concepts.
- Formulate research questions and corresponding statistical hypotheses that can enhance understanding of a given phenomena.
- Create or use existing databases to seek answers to research questions or to test hypotheses.
- Select appropriate statistical techniques (methods) for a given question or hypothesis statement.
- Apply statistical procedures to test hypotheses using appropriate statistical application(s).
- Correctly interpret statistical application output.
- Communicate findings verbally and in written format.

A note on the question of intelligence, capacity, skill & reading the texts: Math and statistics remain a difficult topic for many in our society to understand, become comfortable with, and regularly use as part of their critical thinking. I think that that is a shame and that it is going to fundamentally change as the information revolution continues to ‘outsource’ or ‘off-load’ many of the cognitive elements of what we have historically understood as intelligence and mental or cognitive capacity. Certainly the postmodern and poststructural critique of power, oppression, and control is related to this conversation. The short version of my thinking around this indicates that in general the information revolution is freeing humanity up to express in a legitimate and dignified way the full range of human intelligence and creativity and at the same time share more widely the positive aspects of propositional and logical thought.

Math and statistics are rigorous, detailed, and deep domains of thought. Some people are absolutely brilliant, gifted, and fit for this type of mathematical and complex logical thought. Most of us can, with hard work, diligent practice, and discipline master the rudiments of the field and become competent statisticians or mathematicians. Some of us, however, (and in my view because of inadequate teaching) continue to struggle with basic mathematical and statistical concepts and never develop the skill or confidence to make sense of the field or ask intelligent questions about it. We ‘freeze up’.

It is also the case (again, in my view) that some of the people that totally freeze up in math or work diligently to understand it flourish in other domains. Many other domains. It is a fact that so called ‘scientific thinking’ (led by math and physics but followed by the natural sciences) has the most legitimacy in the academy. This legitimacy is tied historically to economic interests, power, and technical innovation. It is highly abstract even in its corporeal manifestation (e.g., an i-pad). But this is only part of the picture of human consciousness and intelligence[2]. My hero, GH Mead wrote and spoke about reflective human consciousness in general as being ‘scientific
thinking' and that the goal of democratic society was to foster and facilitate this skill in every person.

What this means for this course and for using statistics in research in leadership studies is that we are able to understand more and more and to consider the application of very complex ideas and concepts in ways that were very difficult for most people just a few years ago.

But this competence requires a rethinking of how we approach the task of ‘coming to know' something. It is my view that spending hours and hours to study, practice, and memorize abstract and highly complicated chains of algorithmic reasoning with no clear context for application is not generally productive in the context of the DPLS. So this course will not be done in quite that manner. It will be a highly interactive and collaborative discussion of core concepts and ideas and their relationship to the literature in leadership studies and the social sciences. However we will do problems and practice certain techniques. Those will become clear as the course progresses. What is absolutely vital for us is that we read the texts.

**Reading Math/Statistics**

It is my view that reading is no simple skill. Reading competence is relative to the genre being read. I read some things fluently and immersively. Other genres are fundamentally challenging to me. The only way that I can learn to read foreign genres is through reading and talking about the reading with others. But I have to read. This is nowhere more crucial than in math/statistics. You must read the texts painstakingly! You must make reading notes and question each paragraph, diagram, and list of numbers/equations. You must talk about your understanding and provoke yourself and others to great clarity and depth of meaning. Certainly this sounds paradoxical given what I said above. I guess it is. But hey - paradox is what leadership studies is about in my view! We will talk about this and about my suggestions for reading at our first meeting.

**Final Exam**

There will be a final multiple choice exam for this course. The purpose of this exercise is twofold. On the one hand it is meant to stimulate you to study, read, and discuss diligently. On the other hand it works as an overall assessment of the methods and processes of the course itself. Certainly the main goal of this course is that you become able to use statistics and quantitative methods as part of your research toolkit.

**Lab Process**

Given that we are in the summer session and that Quantitative concepts may be new to some I have decided to facilitate five 3 hour blocks of time independent of formal meetings to help work on, understand, and deepen knowledge and skill related to the course objectives. I see these lab sessions as having a minor thematic focus based on the week's content emphasis but also as a collaborative or individual time/space for clarification and/or deepening. We will meet in Tilford 405 and have access to the computational and networked affordances that the space offers. If I can't make one of the Labs I will make sure that someone is there to open the room and/or facilitate the session. These labs are not required and are open to all members of the course.
Grading:
The grading emphasizes your individual learning achievement in this course.
90 - 100% = A
80 - 90% = A-
70 - 80% = B

Assignments & Tasks
• Please see Blackboard for Course Assignments - these should all be posted by June 1.
• The Course Project will require that each individual imagine, design, test, and write up a mock study using real or imagined data to complete a quantitative research project. See Blackboard for specifics - Assignments > Course Projects - 30% of grade
• Final Exam See Blackboard for specifics - Assignments > 30% of grade
• Readings, reading based assignments, and reflective journal - In this course we will use three text based sources - see below, with suggested readings outlined in the course plan below. It is expected that all students will complete all the reading assignments prior to each class meeting. These readings will form the basis for assignment, class discussions, and exploration of the concepts. The Sirkin text is meant to be both a resource and a primary source of clarification for basic statistical concepts. Selected concepts will be more thoroughly explored in class (e.g., standard deviation, error, variables, probability, p values, t-tests, etc.) Journal entries will be made on Blackboard in the discussion area - see Blackboard > Assignments for specifics on this expectation. (15% of grade)
• Workshop Assignments - These assignments may be completed in our Friday Workshops or done autonomously. See Blackboard for specifics - Assignments > 25% of grade.

Technology Note:
For this course we will be using the Microsoft Excel 2007 (or later) Data Analysis add-in or the Mac Excel 2004 Data Analysis add-in. (note: newer versions of Excel on Mac do not include the Data Analysis add-in). It is your responsibility to acquire the appropriate add-in and have it loaded and fully functioning on a laptop computer at our first meeting. I will be using and referring to Excel 2007 throughout the course. Also note that our work with Excel will be in conjunction with Beverly Dretzke's book referenced below.

If you do not have access to a PC/Microsoft/Excel 2007 or later laptop computer or are a Mac user and are unable to acquire the appropriate add-in please let me know prior to the beginning of the class. We will have access to School laptops and those will be available at each meeting. The space we are meeting in (Tilford 405) is a high tech space with many features that will assist us in our efforts.

Pre-Reading for First Meeting
Read Dretzke (pp. 1-72)
Read Sirkin (pp.1-80)

First Meeting - June 23
• Housekeeping Issues & Group process
• Foundations of the Course
• Readings Review
• Group Work

Readings 2nd Meeting:
  • Dretzke Chapter 5
  • Somekh & Lewin pp. 197 - 214
  • Sirkin Chapters 2, 3, 4, & 5

Workshop 1 - June 24: Dretzke: pp. 45-98 - Frequency Distributions & Descriptive Statistics (see Blackboard for all workshop assignments)

Second Meeting - June 30
  • Readings review and discussion - Formalizing assumptions and using the Scientific Method - Distributions & Frequencies
  • Discussion & Group Work

Readings for 3rd Meeting:
  • Somekh & Lewin pp. 215 - 225
  • Sirkin - Chapter 6
  • Learning From Data Chapter 6 (Blackboard)
  • Dretzke Chapter 6 Probability Distributions

Workshop 2 - July 1: Blackboard data file: Distributions, Descriptive Statistics, Measures of Central Tendency, Dispersion, comparative display and analysis

Third Meeting - July 7
  • Readings review and discussion
  • Measuring Dispersion
  • Probability
  • Contingency Tables

Readings for 4th Meeting:
  • Somekh & Lewin pp. 226 - 235
  • Sirkin - Chapters 7 & 8
  • Dretzke Chapter 7

Workshop 3 - July 8: Dretzke - pp. 99-129 - Probability Distributions & Review

Fourth Meeting July 14
  • Readings review and discussion - Inference & Hypothesis testing
    • t tests and z tests

Readings for 5th meeting:
  • Somekh & Lewin pp. 236 - 249
  • Sirkin - Chapter 9
  • Dretzke Chapter 8

Workshop 4 - July 15: Inferential Statistics, One sample z & t tests
**Fifth Meeting - July 21**
- Readings review and discussion - Hypothesis testing with 2 means.
- Group & Individual Presentations

Readings for 6th Meeting:
- Somekh & Lewin pp. 251 - 273
- Sirkin - Chapters 10-12
- Dretzke Chapter 9

**Sixth Meeting - July 22**
- Somekh & Lewin pp. 274 - 281
- Readings review and discussion - ANOVA - Variation revisited
- Contingency Tables & Association

Readings for 7th Meeting:
- Sirkin - Chapter 13

**Seventh Meeting July - 28**
- Readings review and discussion - Regression
- Wrap up - Research projects July 29.

Workshop 5: July 29 - Regression

**Required Readings**

Other readings and web resources will be required and posted on Blackboard or handed out in class