DPLS 722 Quantitative Data Analysis

Summer 2010 3 Credits
Prerequisites: 3-credit DPLS 720 Principles of Research.
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Office hours: Please email or call for an appointment
Meeting place: Tilford 107
Meeting time: 6-10 pm
Meeting Dates: (2010): 6/22, 6/29, 7/6, 7/9, 7/13, 7/20, 7/27

Course Overview
The course is designed based on previous syllabi of Dr. Sandi Wilson and Dr. Chris Francovich. Data, numbers, units of measure, variables, numerical methods, mathematical expressions, and dynamic modeling are used for communicating phenomena in human affairs.

MATHEMATICS, as a science commenced when first someone, probably a Greek, proved propositions about any things [sic] or about some things, without specification of definite particular things. These propositions were first enunciated by the Greeks for geometry, . . . [then] algebra . . .

The ideas of any and of some are introduced into algebra by the use of letters [such as, x, y, z], instead of the definite numbers [such as, 1, 2, 3] of arithmetic. . . . when put in its strict ultimate form it is an assumption-is of vital importance, both to philosophy and to mathematics; for by it the notion of infinity is introduced (Whitehead, 1958, p. 15-6).

Whitehead, a polymath of science and philosophy, clarified for us about human thought abstractions expressed as variables, such as, x, y, z. Variables represent some numerical values that vary in spatiotemporal context in social events, scientific experiments, and other human affairs enabling us to explain the complexity in leadership phenomena. Statistical data provide the entry point to linear and nonlinear quantitative research modeling methodologies allowing us to understand those phenomena and contribute to leadership studies.

During this course, we emphasize the quantifiable aspects of leadership studies to explore the topography of statistical data and quantitative research reports, the research inquiry and thinking, and analysis of phenomena using numerical methods.

In the first class session, we review theoretical, conceptual, and post-positivist epistemology and quantitative methodology. We contrast this view with both reality (observed substance) and process (emergent dynamics) ontologies juxtaposing quantitative, qualitative, and mixed methods.

Beginning with the second class session through the remainder of the course, we go deeper to explore the scientific methodologies and the development of research hypotheses. Each student
participates simultaneously in three learning activities: Workgroup exercises and class discussions, workgroup projects, and individualized projects:

1. **Workgroup exercises and class discussions:** We learn/review basic statistics using Dr. Sandi Wilson's modules and Dretzke's (2009) *Statistics with Microsoft Excel*. Each student individually posts reflective learning notes on Dretzke and answers to Wilson application questions on the Blackboard (in a designated Workgroup area) prior to class meetings. Then students discuss their postings in Workgroup during class meetings.

2. **Workgroup projects.** We review/investigate published empirical research reports to understand statistical reasoning and other quantitative modeling/methodologies. Discussion and presentation of these studies require a gradually deepening and fundamental understanding of the processes and basic thinking behind the chosen methods.

3. **Individualized projects.** We learn both theory and practice of various linear statistical and non-linear modeling methodologies. This may require students to carry on their own investigations of statistical or other numerical modeling methods appropriate for their individualized projects.

Resources to support learning during this course, besides required books, are available on the Blackboard. Students are encouraged to search optional resources for their individualized projects. Class time and conversation focus on the meaning and understanding of key concepts with the expectation that students work on practice sets and readings on their own. Outcome of group and individual learning projects are presented in class.

**Assignments**

- **Readings:** Required readings are listed in Table-1 *Outline of Class Meetings*. Students are expected to complete all the reading assignments prior to each class meeting. These readings form the basis for class discussions and exploration of the concepts. They are:

**Required Books:**

- Somekh & Lewin (2005) chapters introduce some representative quantitative studies.
- Dretzke (2009) is both a resource for basic statistical concepts and a guide for computing statistical data using Microsoft Office 2007 Excel, replacing SPSS.

Available readings on Blackboard under Course Documents: Dr. Sandi Wilson's four statistics modules, developed for and used in this course for a number of years, provide the primary learning in basic statistics. Other quantitative journal articles and book chapters offer introductions to quantitative research and numerical modeling.

**Reflective journaling:** Students individually post journal entries and reading notes prior to each class meeting in the designated Workgroup discussion area on the Blackboard (see Blackboard > Assignments for specifics on this expectation).

**Wilson's Application Question Exercises:** Dr. Wilson's four modules on Blackboard are a resource for students and the assigned Workgroups. Each module has associated application question exercises, which are completed by each student individually and discussed in
Workgroup and presented by one Workgroup in class. Satisfactory completion of each set of application questions is a basic expectation. See Blackboard for more detail on these assignments.

**Quantitative Modeling:** Individualized projects require each student to imagine, design, test, and write up a mock study using real data to complete a quantitative research project. See Blackboard for specifics Assignments > individualized projects.

**Each class hosts:**
- 1 Workgroup presentation of an assigned journal article with increasingly complex quantitative methods, and
- 2-3 individual presentations of student-selected peer reviewed journal articles.

See Blackboard for specifics Assignments > Course Projects.

**An outcome of this course is the understanding of the following key ideas:**
- Methodological commitments & epistemological assumptions
- Counting, grouping, & clustering
- Unit of measure
- Difference & sameness
- Variable, variability, variation, & variance
- Quantity & measurable quality

**Learning Expectations**
The mathematical and logical foundations of these concepts are explored in a concrete and elementary way to make the seemingly complex and difficult world of numbers coherent. The purpose this course is to prepare doctoral students for the task of both consuming and creating good solid research based on a quantitative methodology of choice.

At the end of this course, students have the capacity to:
- Understand and apply appropriate conceptual frames to positivist, post-positivist, 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 both talking and writing about core statistical concepts.
- Formulate research questions and corresponding quantitative 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 quantitative techniques (methods) for a given question or hypothesis statement.
- Test hypotheses using appropriate statistical and/or numerical application(s).
- Correctly interpret statistical and/or numerical application output.
- Communicate findings verbally and in written format.
**Grading**
The grading emphasizes on your individual learning achievement in this course. You largely determine your grade in this course. What is ‘great' and what is ‘adequate' you can negotiate with the instructor.

Great Effort and great understanding = A  
Great Effort and adequate understanding = A-  
Adequate effort and adequate understanding = B

### Table-1 Outline of Class Meetings

<table>
<thead>
<tr>
<th>#</th>
<th>Readings prior to class</th>
<th>Writing Due</th>
<th>Class Theme</th>
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<tbody>
<tr>
<td>#1</td>
<td>Keller (2006)</td>
<td>Post on Blackboard learning reflections</td>
<td>Housekeeping Issues &amp; Group process</td>
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<tr>
<td>6/22</td>
<td>*Blackboard readings</td>
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<td>Course Foundations &amp; APA format Group Work</td>
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<tr>
<td>#2</td>
<td>Somekh &amp; Lewin pp.</td>
<td>Application questions</td>
<td>Formulas, frequency distribution, Excel</td>
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<td>6/29</td>
<td>197 - 214 (ch. 23-24)</td>
<td>Module 1 due</td>
<td>Group &amp; Individual Presentations</td>
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<td>Dretzke pp. 1-72</td>
<td>Post on Blackboard learning reflections &amp; exercises</td>
<td>Discussion &amp; Group Work</td>
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<td></td>
<td>*Wilson Module 1</td>
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<td></td>
<td>*Blackboard readings</td>
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<tr>
<td>#3</td>
<td>Somekh &amp; Lewin pp.</td>
<td>Application questions</td>
<td>Descriptive statistics &amp; probability distributions</td>
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<tr>
<td>7/6</td>
<td>215 - 235 (ch. 25-26)</td>
<td>Modules 2 Due</td>
<td>Group &amp; Individual Presentations</td>
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<td>Dretzke pp. 73-130</td>
<td>Post on Blackboard learning reflections &amp; exercises</td>
<td>Discussion &amp; Group Work</td>
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<td>*Wilson Modules 2</td>
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<td>#4</td>
<td>Somekh &amp; Lewin pp.</td>
<td>Post on Blackboard learning reflections</td>
<td>Testing hypotheses: one sample means &amp; the difference between two means</td>
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<td>7/9</td>
<td>236 - 250 (ch. 27)</td>
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<td>Group &amp; Individual Presentations</td>
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<td>Dretzke pp. 131-70</td>
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<td>Discussion &amp; Group Work</td>
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<td>*Blackboard readings</td>
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<td>#5</td>
<td>Somekh &amp; Lewin pp.</td>
<td>Application questions</td>
<td>Analysis of Variance, correlation, &amp; regression</td>
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<td>7/13</td>
<td>251 - 259 (ch. 28-29)</td>
<td>Modules 3 Due</td>
<td>Group &amp; Individual Presentations</td>
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<td>Dretzke pp. 171-232</td>
<td>Post on Blackboard learning reflections &amp; exercises</td>
<td>Discussion &amp; Group Work</td>
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<td>*Wilson Modules 3</td>
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<td>*Blackboard readings</td>
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<td>#6</td>
<td>Somekh &amp; Lewin pp.</td>
<td>Application questions</td>
<td>ANOVA</td>
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<td>7/20</td>
<td>260 - 282 (ch. 30-33)</td>
<td>Modules 4 Due</td>
<td>Cross tabulations &amp; random samples</td>
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<td>Dretzke pp. 233-64</td>
<td>Post on Blackboard learning reflections &amp; exercises</td>
<td>Group &amp; Individual Presentations</td>
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<td>*Wilson Module 4</td>
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<td>Discussion &amp; Group Work</td>
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<td>Post on Blackboard learning reflections</td>
<td>Individual project presentations</td>
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<td>7/27</td>
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<td>Wrap Up</td>
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<td>8/2</td>
<td>Research projects due</td>
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*Readings available in the class meeting folders, Course Documents on Blackboard
Required Books


Other required readings
Web resources posted on Blackboard

Optional Readings