REQUIRED MATERIALS


George, D. and Mallery, P. (2004?). SPSS for Windows Step by Step: A Simple Guide and Reference, 15.0 Update Allyn and Bacon: Boston, ISBN: 0-205-37552-9. Version 16.0 of SPSS is now out, but the South Campus bookstore has two copies of the 15.0 Guide. Marginal book! If you wish to skip the purchase of one book, this would be the one I would recommend you not to purchase.

Calculator with square root function. These calculators can cost as little as one dollar.

OPTIONAL MATERIALS:


OR

SPSS Inc. (2008?). SPSS Graduate Pack 16.0 for Windows. [Computer software]. Chicago, IL: SPSS Inc. Just out. But versions 15.0 (and lower) are still good to use. (Allows almost an unlimited number of variables--includes univariate and multivariate analyses). Cost is unknown for SPSS version 16.

Although these programs are relatively expensive, you are strongly encouraged to buy one of them if you have access to a computer at home or at your place of work. We believe that possession of either of these software programs would minimize how many occasions that you have to come to the university campus to utilize the statistics laboratory for your assignments. Purchase of the software also should facilitate the speed with which you will be able to complete your dissertation. The student edition is limited, both in the maximum number of data points permitted, and the breath of statistical analysis it can cover. If you plan on doing a lot of data analysis, or conducting extensive multivariate analysis, the Graduate Pack is recommended over the student edition. The 12th, 13th 14th and 15th versions of SPSS are compatible with Windows XP. If you don’t have Windows XP, you may need a patch to
get the software to run. SPSS version 15.0 is supposed to be compatible with both the VISTA and XP operating systems. The instructor does not know the compatibility of SPSS 16.0 and Windows XP. Check out www.spss.com for compatibility information. We will have access to SPSS version 15.0 in the computer lab.

GRADUATE SCHOOL OF EDUCATION CONCEPTUAL FRAMEWORK

A theme entitled Education for Transformation provides a conceptual framework that unified programs at the Graduate School of Education. The mission of the University of Massachusetts-Lowell is to promote and sustain regional economic development. The Graduate School of Education (GSE) contributes to this mission by developing professionals who help transform the region through leadership roles in education. The GSE’s commitment to “Education for Transformation” produces graduates who:

(1) demonstrate excellent knowledge, judgment, and skills in their professional fields;
(2) promote equity of educational opportunity for all learners;
(3) collaborate with other educators, parents, and community representatives to support educational excellence;
(4) use inquiry and research to address educational challenges; and
(5) possess the collaborative capabilities to transform relationships among people in schools mobilizing them to accomplish purposes they value.

COURSE DESCRIPTION

This course provides a study of quantitative methods used to conduct educational and educationally related research, with a focus on the application of appropriate research models to the critique of published quantitative research and the preparation of research reports. Emphasized is the ability to use quantitative research and research methods in the development and completion of a research project in educational and educationally related settings.

COURSE OBJECTIVES

This course is designed to build upon the master's level introduction educational research course [e.g., RSCH 06.640] received by students by involving the student in developing, implementing, and evaluating a research project in diverse educational settings.

The overall goal of this course is to provide the student with the opportunity to acquire the skills, knowledge, and strategies necessary to perform statistical tests using a computer and to interpret statistical data. The student will be taught to conduct critical evaluations, to use the findings of published research in educational settings, and, most importantly, to design, implement, and to assess the efficacy of an educational or educationally related research project. Attention will be focused upon developing the skills and knowledge needed to formulate dissertation research questions, to design quantitative research studies, and to collect, analyze, and interpret quantitative data. Particular attention also will be given to the use of microcomputers for statistical computation.

All course objectives are designed to enhance the student's ability to both become a consumer and
user of educational research. Course objectives also provide students with the basic tools to become a creator of knowledge. By the end of the semester, the student will be able to:

1. Describe the role of educational research in educational improvement.
2. Define statistical terms and concepts commonly utilized in educational research.
3. Identify research and statistical terms and concepts when reading various types of educational research.
4. Demonstrate knowledge of the types and purposes of measuring instruments.
5. Identify the criteria for selection of a measuring instrument.
6. Calculate basic statistical operations related to the research process.
7. Identify and describe the common graphical methods used for presenting data.
8. Identify appropriate statistical procedures and tests to use for different hypotheses.
9. Explain the difference between statistical and practical significance.
10. Interpret meanings of statistical information found in articles.
11. Use the microcomputer in the research process.
13. Demonstrate basic skills with the ERIC retrieval system information.
14. Demonstrate how to utilize effectively the library and its resources as part of the research process.
15. Identify the different research designs used in educational research.
16. Identify and describe the major threats to internal validity of findings.
17. Identify and describe the major threats to external validity of findings.
18. Describe the major ways to control extraneous variables.
19. Identify and describe the major sections and subsections of a research report.
20. Demonstrate knowledge of how to evaluate research reports using the scientific method.
21. Demonstrate knowledge of the major steps involved in conducting a research study.
22. Identify ethical and legal considerations involved in conducting and reporting educational research.
23. Apply guidelines for presenting papers professionally.

Course Outcomes, Activities, Assessments

<table>
<thead>
<tr>
<th>Activities</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the role of educational research in educational improvement.</td>
<td>Oral Presentation.</td>
</tr>
<tr>
<td>Define statistical terms and concepts commonly utilized in educational research.</td>
<td>Assignment sequence</td>
</tr>
<tr>
<td>Identify research and statistical terms and concepts when reading various types of educational research.</td>
<td>Midterm and final exam</td>
</tr>
<tr>
<td>Demonstrate knowledge of the types and purposes of measuring instruments.</td>
<td>Midterm exam.</td>
</tr>
<tr>
<td>Identify the criteria for selection of a measuring instrument.</td>
<td>Instructor feedback.</td>
</tr>
<tr>
<td>Calculate basic statistical operations related to the research process.</td>
<td>Assignment sequence.</td>
</tr>
<tr>
<td>Identify and describe the common graphical methods used for presenting data.</td>
<td>Assignment sequence.</td>
</tr>
<tr>
<td>Identify appropriate statistical procedures and tests to use for different hypotheses.</td>
<td>Assignment sequence, midterm and final exams.</td>
</tr>
<tr>
<td>Explain the difference between statistical and practical significance.</td>
<td>Understand the concept of “effect” size. Final exam.</td>
</tr>
<tr>
<td>Use the microcomputer in the research process.</td>
<td>Assignment sequence, midterm and final exams, paper.</td>
</tr>
<tr>
<td>Demonstrate skill in writing in the format of the American Psychological Association.</td>
<td>Paper.</td>
</tr>
<tr>
<td>Demonstrate basic skills with the ERIC retrieval system information.</td>
<td>Conduct ERIC search, paper.</td>
</tr>
<tr>
<td>Demonstrate how to utilize effectively the library and its resources as part of the research process.</td>
<td>Literature review section in paper.</td>
</tr>
<tr>
<td>Identify the different research designs used in educational research.</td>
<td>Final exam.</td>
</tr>
<tr>
<td>Identify and describe the major threats to internal and external validity of findings.</td>
<td>Final exam.</td>
</tr>
<tr>
<td>Describe the major ways to control extraneous variables.</td>
<td>Final exam.</td>
</tr>
<tr>
<td>Identify and describe the major sections and subsections of a research report.</td>
<td>Paper.</td>
</tr>
<tr>
<td>Demonstrate knowledge of how to evaluate research reports using the scientific method.</td>
<td>Paper.</td>
</tr>
<tr>
<td>Demonstrate knowledge of the major steps involved in conducting a research study.</td>
<td>Paper.</td>
</tr>
<tr>
<td>Identify ethical and legal considerations involved in conducting and reporting educational research.</td>
<td>Paper.</td>
</tr>
<tr>
<td>Apply guidelines for presenting papers professionally.</td>
<td>Optional: propose to present RSCH 07 640 paper to professional conference</td>
</tr>
</tbody>
</table>

**COURSE EVALUATION**

**GRADING PROCEDURES**

The following grading scale is used at the University of Massachusetts-Lowell.

<table>
<thead>
<tr>
<th>Grade</th>
<th>GPA</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.00</td>
<td>Work of the highest professional standard demonstrating independent and exemplary performance.</td>
</tr>
<tr>
<td>A</td>
<td>4.00</td>
<td>Excellent work demonstrating independent and high quality performance.</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td>Very good work, carefully executed, but requiring some areas of improvement.</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
<td>Good work, indicating careful thought and attention to the task, yet requiring several areas of improvement.</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>Work of graduate standard, but omissions exist or careful analysis is not in evidence.</td>
</tr>
<tr>
<td>Below Graduate Standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
<td>Effort is evident, but work indicates lack of understanding of the demands of the task.</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
<td>Poor quality work with little attention to detail and the demands of the task.</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>Work of very poor quality, indicating no understanding of the depth of analysis required</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>Serious neglect or evidence of cheating</td>
</tr>
</tbody>
</table>

All work is expected to meet the standards of doctoral level work. The form and style manual required for papers is that of the American Psychological Association (APA).

Your performance in this course will be evaluated through a midterm exam (worth 15 percent), a cumulative final exam (worth 40 percent), a short paper (worth 28 percent), an oral presentation based on your paper (worth 5 percent), a series of homework assignments (worth 10 percent) and one short quiz on APA form and style. The quiz will be worth 2 percent of your total grade. Note: There are no make-ups on the APA form and style quiz. If you miss the quiz, I will count the final as 40% of your grade.

Exams are open book, open note.

All evaluations will be z-scored. The z-scores will be combined in the following manner to create the final weighted distribution:

Final Z-score weight=((.15* z-score of your midterm) + (.28* z-score of your paper) + (.40* z-score of your final exam) + (.05 * z-score of oral presentation) +(.10 * z-score of your homework assignments) + (.02* z-score from quiz on APA form and style))

The z-score for the final weighted distribution will be cut into letter grades.

PAPERS

The paper is intended to demonstrate your competence in applying statistics to a specific research problem of your own formulation. You will be expected to devise a concise and non-trivial hypothesis that can be tested with data available for computer analysis. You must state briefly the source of your research problem or question, formulate it as a hypothesis for testing with available data (more on this later), execute the appropriate test, and draw a conclusion about the truth or falsity of the hypothesis—within a suggested maximum of 12 pages, double-spaced (although there are no hard and fast page requirements). You will be required to use APA format for margins, headings, references, etc. Evaluation of this exercise will be based mainly on clarity of presentation and statistical craftsmanship rather than on the substantive or theoretical importance of the problem.

The expected form and style of the paper can be likened to the "research" notes that are occasionally published in education journals. We will look at some examples of such papers. Your paper will not be due until May 15, 2008 (at 11:59 P.M, EDT.) but a one-page progress report stating the hypothesis and data set is due in the two week interval around spring break Thursday, March 20, 2008, for an approximate target.

The date for the midterm (March 13) and final exam (May 22) are listed in the course schedule and notes. The due date for the paper is May 15.
INSTRUCTOR

Mark Fenster.
Office: Room 523 O’Leary Library, Direct Office # 978-934-4633,
Fax # 978-934-3005,
E-mail: mark_fenster@uml.edu OR fenster_21stcentury@hotmail.com

OFFICE HOURS

Tuesdays before and after class: 2:50 P.M.-3:50 P.M. and 6:35 P.M.-7:35 P.M
Thursdays before and after class: 2:50-3:50 P.M. and 6:35-7:35 P.M.

Office hours can be held in the lab [ O’Leary 513) or my office [O’Leary 523 ]. Other hours can be arranged by appointment. However, the best way to contact me is via the following e-mail address: mark_fenster@uml.edu.

Class Cancellation Hotline

If weather is inclement, you might consider checking the class cancellation hotline before making the trip to UML.

978-934-2121

Or the UML website

www.uml.edu

or the following radio stations:

980 AM Lowell
1030 AM Boston
590 AM Nashua
580 AM Worcester

Or the following TV stations:

Channels 4, 5 and 7 in Boston

You can also sign up for text messaging system from UML for updated information about university closure.

ASSIGNMENTS
All assignments will be given deadlines. Contact me in advance if you are unable to turn in an assignment on time. Students are reminded that plagiarism (including copying work from another student, present or former) is strictly prohibited.

MAKE-UP ASSESSMENTS

Make up examinations will be given only in extreme circumstances. Contact me IN ADVANCE if you believe you need special consideration.

Special Needs Statement

University of Massachusetts-Lowell is an equal opportunity educational institution. It is not the intent of our institution to discriminate against any applicant for admission or any student or employee of the institution based on the sex, race, religion, color, national origin or handicap of the individual. It is the instant of the institution to comply with Title VI of the Civil Rights Act of 1964 and subsequent executive orders as well as the Title IX in Section 504 of the Rehabilitation Act of 1973.

Students requesting classroom accommodations or modifications because of a documented disability should contact the appropriate office on campus.

COURSE SCHEDULE

Readings and Assignments

The outline of topics constitutes a table of contents to the course. Be sure to read the accompanying "comments" on the assignments, for they will direct your attention to what you are expected to learn.

**Be sure to keep up with the assigned readings. People who fall behind in statistics classes generally have considerable problems catching up. I expect assignments to be read (and reread) until they are understood.**

Most of the material to be covered will be on a CD-ROM you will be receiving. If you miss a class session, please be sure to get a copy of whatever you missed, but go through the narrated power point mentioned in the syllabus for that week.

Assignments: Assignments are due at the start of class period indicated on the top of the assignment. Failure to turn in an assignment on time will reduce the grade on the assignment by 5 points (out of 100) for every 48 hours the assignment is late, up to a maximum penalty of 10 points per assignment.

Papers are “due” at 11:59 P.M. on May 15, 2008, via e-mail. If your paper is not in my e-mail mailbox, by May 15, 2008 at 11:59 P.M., you lose 5 points (out of 100) for every 48 hours the paper is late, up to a maximum penalty of 10 points.

YOU MUST HAVE A COPY OF YOUR PAPER TO PROTECT YOURSELF IN CASE THE PAPER IS LOST.
Information on the Paper: The paper will demonstrate your ability to integrate statistical theory with data. The skills learned throughout the course will build up to the paper.

In deference to the APA manual, the paper should have five sections:

1. Introduction and literature review [Why the problem studied is important, and what did prior researchers say about this topic about the topic.] (20% of paper grade).

2. Methodology. [How you addressed the problem specified in the first two sections of the paper.] (19% of paper grade. This section should include a discussion on methods, techniques, or modes of inquiry and data sources or evidence).

3. Results. [What you found. Were your hypotheses supported?] (36% of paper grade).

4. Conclusion. [What was the importance of your contribution to knowledge?] (10% of paper grade).

5. Educational or scientific importance of the study.(10% of paper grade.)

An abstract to the paper will be required and counts 5% towards the total grade.

Statistical craftsmanship is the most important criterion in grading the paper. However, other components of writing a paper count in the grading. I expect that your hypotheses will be well grounded into prior literature. The methodology section should be as well grounded into the literature as possible. Your grade on the paper will be mostly based on sections 2 and 3. However, poorly presenting the first section will make it difficult for you to write an appropriate section 3, 4 and 5. I expect that you will draw on course work outside RSCH 07.640, literature searches in the library and on the Internet, and any other materials needed to write the first section of the paper well.

Please note: We care very much about your future development. We will do EVERYTHING that we can to prepare you to be an effective researcher.

Course Outline

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic(s)</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week1: 01/31/2008</td>
<td><strong>HaPpY mArDi GrAs! (Five days early!)</strong> Individual introductions Distribution of questionnaires Introduction to Course Graphical Presentation of Data The Use and Abuse of Statistics Brief Introduction into Measurement Theory Developing quantitative-based research questions</td>
<td>Read Thorndike and Dillon Chapters 1-4, especially pages 14-19. <strong>You are NOT responsible for ANY material on grouped data.</strong> (pages 31-25, 64-66,70-75,85-86,88-90,99-102) SPSS Manual: Skim chapters 1-4, read chapter 5</td>
</tr>
</tbody>
</table>
| Week 2: 02/07/2008 | Discussion of Institutional Review Board (IRB)  
Univariate Statistics:  
Measure of Central Tendency  
Measures of Dispersion | Thorndike and Dillon:  
Reread chapters 3 and 4.  
Read chapter 5.  
RSCH Linear and non-linear transformations FINAL |
| Week 3: 02/14/2008 | HaPPY vALeNtInEs DaY!!!  
The Normal Distribution  
Skewness, Kurtosis | Thorndike and Dillon: Read selectively in chapter 6:153-163.  
Also read Chapter 10.  
Narrated Powerpoints on:  
Normal and skewed distribution I final narrated.  
Narrated powerpoints on:  
Kurtosis FINAL narrated 1a  
Continuous and Discrete variables final narrated. |
| Week 4: 02/21/2008 | APA Formatting  
Reliability and Validity  
Conducting literature searches | Skim APA manual, especially material on the author-date citation method.  
Thorndike and Dillon:  
Reread pages 20-23.  
Rread pp. 13-14.  
Appendix B [Pages 461-467.]  
Narrated Power Points:  
Hummel's APA powerpoint on APA 5th edition |
| Week 5: 02/28/2008 | **APA Quiz**  
Describing Relations between variables: Bivariate Statistics: The Product Moment Correlation  
Linear Regression: General Theory | Thorndike and Dillon: Read chapters 7 and 8.  
SPSS Manual chapter 10  
SPSS Manual chapter 15  
Narrated Power points: Go through Correlation 1a FIRST, then go through Calculation of r and rho minor corrections 1a |
|------------------|--------------------------------|------------------------------------------------------------------|
| Week 6 03/06/2008 | Linear Regression: Assumptions  
Measures of Association for Nominal Level Data: Contingency Tables | Go through narrated power point on Bivariate Analysis for Contingency Tables 1b narrated.  
Go through Narrated Powerpoints: Simple (bivariate regression). |
| **Week 7: 03/13/2008** | **MIDTERM ASSESSMENT**  
Evaluation of Midterm  
Discussion of Research Papers | Go through narrated Powerpoint on RSCH paper narrated |
| **03/20/2008** | **Happy St. Patrick’s Day** | No class! Spring Break!  
Due: In two week interval, a one page progress report on the paper |
| **Week 8: 03/27/2008** | **AERA meeting in the Big Apple. No class.**  
Instructor will be presenting at the AERA meeting on March 26, so class in cancelled for the week. | |
| **Week 9 04/03/2008** | **Sampling Theory and samples** | Skim read (for concepts ONLY) Thorndike and Dillon, chapter 15 |
| Week 10: 04/10/2008 | Testing Hypothesis and predicting to Populations: General Theory  
Estimating Population Values from Sample Data  
Alpha Values and Critical Regions  
One and Two-Tail Tests | Thorndike and Dillon, Chapter 6 (pages 142-153.  
Chapter 9.  
RSCH Hypothesis testing narrated powerpoint. |
|-------------------|-------------------------------------------------|--------------------------------------------------|
| Week 11: 04/17/2008 | Testing Hypothesis and Predicting to Populations: Applications  
Difference of Means Test: Single Sample Tests  
Difference of Means Test: Two Sample Test  
Bivariate Correlations | Thorndike and Dillon, Read chapters 11-12.  
Go through narrated Powerpoint on:  
RSCH 701 Fall 2006 independent t-tests  
And, RSCH 701 Fall 2006 paired t-tests. |
| Week 12: 04/24/2008 | Effect size | Thorndike and Dillon, read chapters 13-14.  
SPSS manual, chapters 11 and 12.  
Go through narrated Powerpoints on:  
(1) RSCH 701 Fall 2006 t-tests and effect size.  
(3) Tests of statistical significance involving correlations. |
| Week 13: 05/01/2008 | **Happy May Day!**  
Testing Hypotheses Without Predicting to Populations | Read Thorndike and Dillon, chapter 15  
Reread: SPSS Manual, |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 15: 05/15/2008</td>
<td><strong>Oral Presentations of paper. Review for final.</strong></td>
<td><strong>PAPERS DUE !</strong></td>
</tr>
<tr>
<td>Week 16: 05/22/2008</td>
<td><strong>FINAL ASSESSMENT</strong></td>
<td><strong>Course Over!</strong></td>
</tr>
</tbody>
</table>
Comments on readings

I. Classes 1-4, quantitative analysis in educational research

Thorndike and Dinnel first eight chapters discuss descriptive statistics. The first part of this course treats descriptive statistics; the second part covers inferential statistics. The order is reverse of most statistics courses, which cover probability theory and related topics necessary to statistical inference at the very beginning. Thorndike and Dinnel (and I) think it wiser to begin with the simpler descriptive statistics, for which applications are more readily illustrated.

On pages 16-20 Thorndike and Dinnel distinguishes among several "levels" of measurement; nominal, ordinal, interval and ratio. This is a standard classification scheme and you should learn it well. Every statistical test covered in RSCH 07.640 will require knowledge of this classification scheme.

Frequency Distributions

Frequency distributions are informative but clumsy. The essential information in frequency distributions can often be summarized with two types of statistics: (1) measures of central tendency and (2) measures of dispersion or variation. Chapter 5 of the SPSS manual describes a wide variety of graphing procedures quite nicely.

Measures of Central Tendency and Dispersion

Two key components of this course are measures of central tendency (mean, median and mode) and measures of dispersion (range, inter-quartile range and standard deviation). You may have a greater comfort level with measures of central tendency, but measures of dispersion are far more useful to researchers.

Variability in observations really lies at the heart of statistical analysis. Most research is directed at determining why some person, school, group, program, or learning community differs on some variable from other persons, schools, groups, programs or learning communities. Indeed, if the cases did not differ, we would not be observing a variable. Fundamental to variability in statistical analysis is the concept of variance. Be sure you know it well, along with its related concept, standard deviation.

The Normal Distribution

You will find that a thorough understanding of the normal distribution is very important to inferential statistics in the second part of the course. Study the material in Thorndike and Dinnel on pages 129-137 very carefully.

Skewness, Kurtosis, and SPSS
SPSS gives us a number of ways to analyze univariate distributions: BE SURE YOU UNDERSTAND THE DISTINCTION BETWEEN DISCRETE AND CONTINUOUS VARIABLES! [See Thorndike and Dinnel, pp. 14-16]. Which SPSS procedure(s) are most appropriate for discrete variables? You might want to look at the SPSS manual, pages 97-104.

II. Classes 3-4, IRB and APA form and style requirements

Class 3: Conducting Literature Searches

You have MANY options to conduct literature searches using databases available on-line at UMass-Lowell, from your computer at home, the workplace, or the UMass library itself. We will explore a few of these options

Class 4:

We will spend today’s class going over APA form and style requirements. Additionally, we will cover two topics, reliability and validity that have concerned researchers for many years. Much of the current debate over performance assessments in k-12 state mandated assessments can be traced to arguments over reliability and validity. Lastly, we will cover issues concerning your needs to secure approval from UMass-Lowell’s IRB to conduct research for this course.

Appendix B of Thorndike and Dinnel cover the rudiments of validity and reliability.

Class 5: The Product-Moment Correlation

Correlational analysis is one of the most common techniques in educational research. In essence, it tells us how strongly two variables are related. The strength of an association between two interval-level variables is expressed by the coefficient of determination, which is simply the square of the product moment correlation. A related measure of association for ordinal data is Spearman's rho. We will consider alternatives to rho later.

Class 6: Review and Preview of Midterm Type Questions

Measures of Association for Nominal level data
Interpreting SPSS bivariate printout
Transformations and Sorting in SPSS

Unlike economists who generally deal in interval level data, educational researchers often must rely on nominal and ordinal data. These data are commonly analyzed in contingency tables, often only with the aid of percentage comparisons. Our book (Thorndike and Dinnel) covers this information as an inferential statistic in chapter 15, which is a little ahead of where we need to be at this time.

Comments: Lambda is said to have a "PRE" interpretation. Be sure you what a "PRE" interpretation means. How is a PRE interpretation useful in prediction?

We will spend some of this session going over SPSS procedures. BE SURE YOU KNOW
WHAT EACH SPSS PROCEDURE IS USED FOR. YOU MAY FIND SUCH INFORMATION HELPFUL ON YOUR MIDTERM.

Your midterm assessment will be mainly short problems, such as the ones you have been doing in your homework assignments. There will be some multiple-choice questions (mainly on material in Thorndike and Dinnel). I will pass out a short sample preview midterm with the type of questions you might see on the examination itself.

Class 7

MIDTERM EXAMINATION
Evaluation of Midterm AND Discussion of Research Papers (in class)

Comments: Today, you take the midterm assessment. Second, we go over the midterm (make sure you understand all the errors you made). REMEMBER, THE MIDTERM COUNTS ONLY 15% OF YOUR FINAL GRADE. YOUR GRADE IS NOT "ETCHED IN STONE" BECAUSE OF YOUR MIDTERM PERFORMANCE.

Lastly, today we discuss the research papers. I will pass out a specific guide to preparing the paper for this course. I encourage each of you to choose a topic that allows you to analyze data you have access to (via Internet, workplace, or some other form), or are able to collect on your own. If you prefer, you can use a data set that I made available to the class.

Class 8: Cancelled due to AERA meeting in the Big Apple.

Classes 9 and 10: Sampling

Thorndike and Dinnel’s chapter 9 discuss a variety of different sampling frameworks. We will discuss each of these. Additionally, we will begin to discuss inferential statistics. We will use a random number generator to illustrate the “law of large numbers”.

STATISTICAL INFERENCE: SAMPLING THEORY

Classes 11-14

Statistics courses in mathematics departments devote great attention to probability theory. Unfortunately, they usually pay little attention to measuring variables, which we emphasize. Some knowledge of sampling theory, however, is crucial to statistics, especially to statistical inference, which enables us to make predictions to populations based on data from samples of the population. Be careful, this material will require close reading.
We distinguish between the distribution of some variable in the population and the distribution as observed in a sample. We discuss the (hypothetical) sampling distribution of means observed in an infinite number of samples. If you are a normal human being, you will find this notion of a "sampling distribution" difficult to understand at first, but you will grow to believe in it. Be sure you understand that the standard error of the mean is the standard deviation of the sampling distribution of the mean.

TESTING HYPOTHESIS AND PREDICTING TO POPULATIONS: GENERAL THEORY

Estimating Population Values from Sample Data
Alpha Values and Critical Regions
One and Two-Tail Tests

Alpha values and critical regions are linked in testing of hypotheses. How are they linked?

Regarding the distinction between one and two tail tests, we sometimes say that two-tail tests are for non-directional hypotheses, while one-tail tests are for directional hypotheses. Make sure you grasp this distinction. **Which type should your research employ?**

TESTING HYPOTHESIS AND PREDICTING TO POPULATIONS: APPLICATION

Difference of Means test: Single Sample

The difference of means test for a single sample applies when one wishes to determine if one sample (e.g., gains made by schools on state-mandated assessments in Kentucky) differs significantly from a given population (e.g., gains made by all schools in the state). For the first time, you will be reading about "levels of significance" and "significant" statistics. Be sure you understand the relationship of the "alpha value" to the level of significance and the critical region.

Difference of Means test: Two Sample Tests

Two-sample difference of means test is one method to compare two groups on a common dependent variable. Thorndike and Dinnel’s book covers this test on page 320-340.

TESTING HYPOTHESES WITHOUT PREDICTING TO POPULATIONS

Nonparametric tests: Chi-Square

Thorndike and Dinnel’s book deals with chi-square (e.g., $\chi^2$) on pages 347-350. Chi-square is one of the most common tests of statistical significance used by researchers. Its popularity lies in its applicability to nominal level data and in its intuitive basis of understanding between "expected" and "observed" frequencies.

$\chi^2$ is said to be sensitive to sample size. Be sure you know why this is true.

As a soft summer night inspires songwriters to compose romantic ballads, chi-square inspires statisticians to construct measures of association. They seek to capture its special capacity to
detect differences between observed and expected frequencies. Unfortunately, all of the various chi-square measures of association have important shortcomings, which explain why lambda is usually the preferred measure of association for nominal level variables.

Class 14:

Introduction in to Simple Regression
Introduction in to Multiple Regression
Reasons for Using Multiple Regression

Comments: Linear multiple regression is one of the most powerful and popular techniques of multivariate analysis in statistical analysis. It finds the best linear and additive combination of independent variables for predicting to a single dependent variable. The technique assumes that the data are interval in character, but it is frequently applied to ordinal data and even nominal variables when reduced to dichotomies and treated as "dummy" variables. There are some problems associated with these departures from the classical measurement assumptions, but sensible departures seem worth the risks, for the technique is so revealing in its analysis. We will concentrate mainly on the capabilities of regression analysis, rather than the limitations. In reading the material for this week, pay special attention to the distinction between standardized regression coefficients (Betas) and unstandardized coefficients (b's). Which type is produced when the input data is in the form of z-scores?

Statistical vs. Experimental Controls

Comments: There are two major ways to control for variables in the education field. One method is to control for variables experimentally. With experimental control, the researcher directly manipulates the independent variable and assesses what (if any) difference such manipulation has on a dependent variable. Experimental controls are rarely used in educational research. A second way to control for variables is through statistical techniques. When we say we are controlling a variable in regression, we mean we are controlling for its effects statistically.

We will finish the substantive part of the course today. We will have some time to provide assistance to people working on their research papers.

Class 15: Oral Presentations and PAPER DUE! Additionally, we will review for the final.

Comments: Papers are “due” at 11:59 P.M. on May 15, 2008. Papers should be e-mailed to me (mark_fenster@uml.edu). If I don’t receive the paper by 11:59 P.M. on May 15, 2008, you lose 5 points (out of 100) for every 48 hours the paper is late, up to a maximum penalty of 10 points.

YOU MUST MAKE A COPY OF YOUR PAPER/ OR KEEP COPY OF PAPER ON YOUR DISKS, HARD DRIVE/WEB LINK (etc.) TO PROTECT YOURSELF IN CASE THE PAPER IS LOST.

FINAL EXAM: May 22, 2008, during class time.
My best wishes for a happy, productive Summer!