EPsy 8261 - Statistical Methods I: Probability and Inference
225 Peik Hall, T,Th 4:40 PM - 5:55 PM
Fall 2008

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COURSE DESCRIPTION

EPsy 8261 is the first course of the two-semester Ph.D. level statistics sequence in Educational Psychology at the University of Minnesota. This course will cover statistical methods used in educational research. Topics will include exploratory data analysis, probability distributions used in hypothesis testing, one- and two-sample hypothesis testing and confidence intervals, one- and two-factor, between-subjects analysis of variance for fixed effects models, post hoc contrast testing, and a priori power and sample size calculations. The course will emphasize the conceptual framework underlying these methods along with their application to education related research. The use of statistical software will be emphasized throughout the course.

The course is applied, meaning the focus is on conceptual issues important in applied research. A consequence of this focus is that the mathematical bases of the methods will not be stressed (e.g. no mathematical proofs will be given in the course). *The student wishing more mathematical rigor is referred to the masters' level or Ph.D. level sequence in the Department of Statistics.*

Though this course is applied in nature, it is assumed that the student has at least a *working knowledge* of

high school algebra (e.g. you should know things such as ⬚, ⬚, etc.). In addition, *it*

is assumed that the student has had at least one undergraduate-level or masters' level introductory statistics course. If a student feels nervous about mathematics and has never had a statistics course, it is recommended that the student drop this course and enroll in the masters' level course sequence EPsy 5261 & 5262 (although these courses are *not* preparatory courses for EPsy 8261). Alternatively, the nervous student might consider dropping this course and enrolling in an appropriate college-level algebra course.

POSSIBLE TEXTBOOK

- Agresti, A., & Finlay, B. (2008). *Statistical Methods for the Social Sciences, 4th Edition.* Upper Saddle River, NJ: Prentice Hall.
- Howell, D. C. (2006). *Statistical Methods for Psychology*, *6th Edition*. Pacific Grove, CA: Duxbury Press.
- Moore, D. S., McCabe, G. P., & Craig, B. (2007). *Introduction to the Practice of Statistics, 6th Edition*. New York: Freeman.
- Verzani, J. (2006). *Using R for Introductory Statistics.* Boca Raton, FL: Chapman & Hall/CRC Press.

COURSE WEBSITE

Supplemental notes, lab assignments, data files, etc. are available on the course website (http://www.tc.umn.edu/~zief0002/8261.htm). There are some important things to note about using the website. First, the website works best with a recent version of Mozilla Firefox or Safari. Second, if you are using a Mac and seem to have problems downloading files, hold the option-key while clicking on the link. This should download the file to your desktop. If all else fails, the materials can be downloaded and printed in the *Educational Psychology Computer Lab (see section below)***.**

REQUIRED READING

There are several articles, papers and technical reports that you will need to read during the semester. These can be obtained through the links on the calendar from the course website (http://www.tc.umn.edu/~zief0002/8261.htm). In order to access the full text of some of the articles, you will need to log in using your University x500 username and password. The full citation for each paper is also provided in the bibliography part of the course website (http://www.tc.umn.edu/~zief0002/8261Bibliography.htm).

TECHNOLOGY & SOFTWARE

You will need *Adobe Acrobat Reader* (http://www.adobe.com/downloads) or *Preview* (Mac) to read and print all the materials. This program is free and comes already installed on most new computers. You will also need access to a statistical package. The course will emphasize the use of *R,* however students may opt to use a different statistical package. *R* is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS (http://www.r-project.org). Finally, you will need a program called *G*Power 3*. This is available free at http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/.

The course uses technology on a regular basis during both instruction and assessments (e.g., labs, exams, etc.). *Student difficulty with obtaining or operating the various software programs and technologies will not be acceptable as an excuse for late work*. Due to the variation in computer systems and the difficulty in assessing problems via email, the instructor and TA may not be able to assist in trouble shooting all problems you may have. In these cases, contact the university Academic and Distributed Computing Services (ADCS) at http://www1.umn.edu/adcs/help/ , or your systems administrator (if you have one).

EDUCATIONAL PSYCHOLOGY COMPUTER LAB

The Peik Hall Computer Labs (Peik Hall 325 and Peik Hall 355) will have some open times during the week and I will announce those times when they are made known to me. All the machines in the computer lab of Peik Hall 325 have *R* and *G*Power 3*. There are other various computer labs on campus that have some of these programs installed. You are encouraged to visit the (ADCS) website to locate these computer labs, http://www2.publabs.umn.edu/indexe.html.
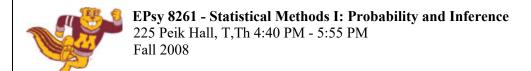
LAB ASSIGNMENTS

There will be several graded computer lab assignments to be worked outside of class using a statistical software package. In working the lab assignments, you are expected to pull together the material from the lectures, the text, and the supplemental notes where applicable. Students are encouraged to work in groups and consult with one another on the lab assignments. However, each individual student needs to turn in a lab with his/her own independent work and write-up. The lab assignments and data sets will be available from the course website. The lab assignments are guided, but general help with *R* is available from both the *R* Help files and the TA. *The TA can only help you produce the output. The TA will not help you answer the lab questions.*

Late Labs: There will be a penalty for late labs. *Total points possible will be reduced by 25% for each day (not class session) that a lab is late.* Please familiarize yourself with the due dates listed for the labs.

Lab Assignments and Plagiarism: It is important that the student synthesize the pertinent information when writing up the labs. Synthesis does not occur when large blocks of text are copied from the textbook or my notes and used to answer the lab questions. The university has policies against such behavior calling it "scholastic misconduct." *It is understood that the student will have to use some verbatim phrases and definitions from the textbook or notes.* This is not considered a case of scholastic misconduct. For example, the textbook may have a sentence reading "The mean of the IQ distribution is $\bar{X}$." If the output indicates that $\bar{X} = 101$ and you are asked to provide the mean of the IQ distribution, it is perfectly lawful for you to write "The mean of the IQ distribution is 101." *What must be avoided is extensive verbatim copying of information from the textbook or my notes when answering the longer questions in the labs.* Such behavior falls under "scholastic dishonesty", which is defined by the Office of Student Academic Integrity as:

> *"...plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis."*

E-mailing and Turning in Labs: No labs will be accepted via e-mail or turned in to the instructor's or TA's mailbox without prior instructor approval. Any lab submitted in either of these manners without prior approval will be thrown away or deleted, and will be considered to have been not submitted with the appropriate penalties applied. If approval is granted to turn in a lab via e-mail, the *only acceptable format is a PDF file.*

CALENDAR

The calendar below lists the tentative dates of the lecture topics and the due dates for the labs and the exams. A more comprehensive calendar that includes the required reading can be found on the course website (http://www.tc.umn.edu/~zief0002/8261.htm).

Session	Date	Topic
1	2-Sep	Introduction
2	4-Sep	*Introduction to R*
	4-Sep	**Install R on your Computer**
3	9-Sep	EDA
4	11-Sep	EDA
	11-Sep	**Lab #1 Due**
5	16-Sep	*More Introduction to R*
6	18-Sep	EDA
7	23-Sep	One-Sample Test
	23-Sep	**Lab #2 Due**
8	25-Sep	One-Sample Test
9	30-Sep	One-Sample Test
10	2-Oct	Interval Estimation
11	7-Oct	Effect Size
	7-Oct	**Lab #3 Due**
12	9-Oct	Effect Size
13	14-Oct	Power
14	16-Oct	Power
15	21-Oct	Two-Sample Test
	21-Oct	**Lab #4 Due**
16	23-Oct	Two-Sample Test
17	28-Oct	Two-Sample Test
	28-Oct	**Lab #5 Due**
18	30-Oct	*Fitting Models with R*
19	4-Nov	One Factor Between-Subjects ANOVA
	4-Nov	**Lab #6 Due**
20	6-Nov	One Factor Between-Subjects ANOVA
21	10-Nov	One Factor Between-Subjects ANOVA
22	13-Nov	Post Hoc Contrast Testing
	13-Nov	**Lab #7 Due**
23	17-Nov	*Fitting Models with R: Part II*
24	20-Nov	Factorial Analysis of Variance
25	25-Nov	Factorial Analysis of Variance
	25-Nov	**Lab #8 Due**
26	2-Dec	Factorial Analysis of Variance
27	4-Dec	Factorial Analysis of Variance
28	9-Dec	(Open Day)
	9-Dec	**Lab #9 Due**
	16-Dec	**Lab #10 Due**

GRADING

Your final grade will be determined by a combination of your lab scores (10% for each lab assignment)*.* The labs will be the *only* basis for your grade. Grades will be assigned by the following standards:

Percentage	Grade	Percentage	Grade	Percentage	Grade
94.0%	A	80.0%	B	68.0%	C
88.0%	A–	75.0%	B–	65.0%	C–
85.0%	B+	72.0%	C+	Below 65.0%	F

These standards *may* shift downward depending on overall class performance. Shortly after the course, you may access your grades online at http://www.onestop.umn.edu. To access your grades via telephone, call the Gopher Student Line at 612-624-5200. Uncollected labs and the exams will be retained for one (1) semester after the course, and then discarded.

Questions regarding grading: Questions regarding grading are to be directed only to the instructor. Please do not contact the TA regarding grading. The TA will grade all exams and labs under the instructor's strict parameters and thus the instructor is responsible for all issues regarding grading.

Extra Credit: Extra credit" assignments or exams will *not* be available, so please do not request such things.

S/N (Satisfactory/Not Satisfactory) Grading and Incompletes: *Students fulfilling the Educational Psychology statistics core requirement are not allowed to take this course as S/N.* If a student is not fulfilling a core requirement, he/she may take this course S/N with the following understanding of a minimum requirement for an "S." Quoting from the university grading policy, "achievement required for an S is at the discretion of the instructor." Because this is a Ph.D. level course, the minimum criterion for an S in this course will be the equivalent of a letter grade of B- (*not C- as in many undergraduate courses*), which translates into a minimum of 75%.

Incompletes for this course will be given on a case-by-case basis. The University's Senate Committee on Educational Policy states, "the I (incomplete) shall be assigned "at the discretion of the instructor when, due to *extraordinary circumstances* (e.g., hospitalization), a student is prevented from completing the work of the course on time." Note the italicized phrase in the previous sentence. The most valid reason for an incomplete is an unforeseen event that *gravely* interferes with a student's ability to perform at an adequate level. Incompletes will not be given for avoidable problems such as unwise planning. The complete language covering the incomplete can be found at
http://www.fpd.finop.umn.edu/groups/senate/documents/policy/gradingpolicy.html (Section III(1)).

MISSION STATEMENTS

Quantitative Methods in Education (QME)
The Quantitative Methods in Education (QME) track offers educational opportunities in both quantitative and qualitative methods with a broad array of introductory and advanced coursework. Students who choose QME as their track within educational psychology may specialize in any of four areas: *measurement, evaluation, statistics, and statistics education.* The goal of QME is to provide students with broad but rigorous methodological skills so that they may conduct research on methodologies, may help to train others in methodology, or will have the skills necessary to conduct research in related fields.

Psychological Foundations of Education Program Mission Statement
To apply and generate knowledge of psychological processes and methodological procedures involved in learning and teaching for the betterment and improvement of humans in a wide range of situations.

Department of Educational Psychology Mission Statement
Educational psychology involves the study of cognitive, emotional, and social learning processes that underlie education and human development across the lifespan. Research in educational psychology advances scientific knowledge of those processes and their application in diverse educational and community settings. The department provides training in the psychological foundations of education, research methods, and the practice and science of counseling psychology, school psychology, and special education. Faculty and students provide leadership and consultation to the state, the nation, and the international community in each area of educational psychology. The department's scholarship and teaching enhance professional practice in schools and universities, community mental health agencies, business and industrial organizations, early childhood programs, and government agencies.

Adopted by the Dept. of Educational Psychology faculty October 27, 2004.

College of Education & Human Development Mission Statement
The new College of Education and Human Development is a world leader in discovering, creating, sharing, and applying principles and practices of multiculturalism and multidisciplinary scholarship to advance teaching and learning and to enhance the psychological, physical, and social development of children, youth, and adults across the lifespan in families, organizations, and communities.