



EPsy 8261: Probability & Inference

Instructor and Teaching Assistant

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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. 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.

Textbook

Required

- Howell, D. C. (2009). *Statistical Methods for Psychology, 7th Edition*. Pacific Grove, CA: Duxbury Press.
- Verzani, J. (2002). *simpleR: Using R for introductory statistics (version 0.4)*.
<http://cran.r-project.org/doc/contrib/Verzani-SimpleR.pdf>

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. Full references for these readings are provided in the *Readings* section of the syllabus. Most of the articles themselves are accessible through the University of Minnesota library website (<http://www.lib.umn.edu>). 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.

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*Power3*. This is available free at <http://www.psych.uni-duesseldorf>.



[de/abteilungen/aap/gpower3/](http://www1.umn.edu/adcs/help/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, including all day on Fridays. 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/index.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.*

Lab Grading & Late Labs

Each the labs will be given a letter grade that reflects a holistic assessment of your understanding of the material based upon your responses to the questions provided. For a more complete description of the evaluation process, please see the *Evaluation of Student Labs* document available on the course website. There will be a penalty for late labs. The lab grade will be *reduced by 1/3 of a letter grade 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{Y} .” If the output indicates that $\bar{Y} = 101$ 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.



EPsy 8261: Probability & Inference
Nicholson Hall 110, M,W 8:00 AM—10:30 AM
Summer 2009

Session	Date	Topic	Reading
1	June 15	Introduction/ Introduction to R <i>Install R on your computer</i>	[A6]
2	June 17	EDA <i>Lab #1 Due</i>	[H1, H2]
3	June 22	EDA/One-Sample Test	[H4]
4	June 24	One-Sample Test <i>Lab #2 Due</i>	[A4]
5	June 29	Permutation/Randomization Test	
6	July 1	Permutation/Randomization Test <i>Lab #3 Due</i>	
7	July 6	Normal Theory Approximation: Two-Sample Test	[H7]
8	July 8	Interval Estimates	[A1]
9	July 13	Effect Size	[A5]
10	July 15	Power <i>Lab #4 Due</i>	[H8, A2]
11	July 20	One-Factor Between-Subjects ANOVA	[H11]
12	July 22	One-Factor Between-Subjects ANOVA Post Hoc Contrast Testing	[A7] [H12]
13	July 27	Factorial ANOVA <i>Lab #5 Due</i>	[H13]
14	July 29	Factorial ANOVA	[A3]
15	Aug 3	TBA	[A8]
16	Aug 5	TBA <i>Lab #6 Due</i>	



Readings

The H refers to chapters in the Howell textbook. Thus [H1] would indicate that you should read chapter 1 in Howell. The A refers to an article. The reference to each of the articles is listed below.

- [A1] Dimitrov, D. M., & Rumrill, Jr., P. D. (2003). Pretest-posttest designs and measurement of change. *Work*, 20(2), 159–165.
- [A2] Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191(17).
- [A3] Gelman, A., Pasarica, C., & Dodhia, R. (2002). *Let's practice what we preach: Turning tables into graphs* *The American Statistician*, 56(2), 121–130.
- [A4] Gossett, W. S. (1908). On the probable error of a mean. *Biometrika*, 6, 1–24.
- [A5] Kelley, K. (2007). Confidence intervals for standardized effect sizes: Theory, application, and implementation. *Journal of Statistical Software*, 20(8), 1–24.
- [A6] Kelley, K., Lai, K., & Wu, P.-J. (2008). Using R for data analysis: A best practice for research. In J. Osbourne (Ed.), *Best practices in quantitative methods* (pp. 535–572). Newbury Park, CA: Sage. http://nd.edu/~kkelley/publications/chapters/Kelley_Lai_Wu_Using_R_2008.pdf
- [A7] Wainer, H. (1984). How to display data badly. *The American Statistician*, 38(2), 137–147.
- [A8] Wilkinson, L., & Task Force on Statistical Inference, APA Board of Scientific Affairs. (1999). Statistical methods in psychology journals: Guidelines and explanations. *American Psychologist*, 54(8), 594–604.



Grading

Each lab will be given a holistic grade and feedback by the instructor. This grade will be then given a score as follows,

Points	Grade	Points	Grade	Points	Grade
6	A	3	B	0	C or Below
5	A-	2	B-		
4	B+	1	C+		

Your final grade will be determined by averaging your six lab scores. The labs will be the only basis for your grade. Shortly after the course, you may access your final grade online at <http://www.onestop.umn.edu>. To access your grade via telephone, call the Gopher Student Line at 612-624-5200. Uncollected labs will be retained for one 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 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



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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.