

RMTD 482
Introduction to Linear Models

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School of Education Conceptual Framework

Our School's Conceptual Framework – *Social Action through Education* – guides the curricula of School of Education programs in the preparation of carrying out the mission of social justice. These dimensions of the conceptual framework also serve as the foundation to the School of Education – standards that are explicitly embedded in major benchmarks across all SOE programs. Our conceptual framework is described here: www.luc.edu/education/mission/. Social inequities exist for many subgroups within the population (including but not limited to subgroups based on race, gender, sexual orientation, social class, ethnicity, and ability). This course will help students develop the foundational knowledge needed to carry out quantitative research that could offset social inequities that exist in our society for one, some, or all groups.

Course Content

This course introduces students to techniques of data analysis and statistical inference commonly used in educational and psychological research. The major topics are simple/multiple regression, simple analysis of variance (one-way ANOVA), and factorial analysis of variance (two-way ANOVA) followed by multiple comparisons, and analysis of covariance (ANCOVA).

Knowledge of basic algebra is required, as is an understanding of the fundamental principles of descriptive statistics and hypothesis testing (as taught, for example, in RMTD 404/421 or equivalent). Knowledge of calculus is not required.

Technological Knowledge and Skills

Students will analyze the NELS:88 (National Education Longitudinal Study of 1988) and other example data sets, using SPSS. This NELS:88 data set is one of the largest and most important datasets collected by the U.S. government. It includes extensive measurements of students' beliefs, aspirations, attitudes, and background, as well as related information from teachers, parents, and schools.

Required text

Howell, D.C. (2013). *Statistical Methods for Psychology* (8th ed.). Belmont, CA: Wadsworth, Cengage Learning.

Recommended Text (Only need one—The first option is online and free; the second option is for those who prefer to have a physical book as a resource)

- 1) Howell, D.C. (2011). *Fundamental Statistics for the Behavioral Sciences* (7th ed.).

<http://www.uvm.edu/~dhowell/fundamentals7/SPSSManual/SPSSLongerManual/SPSSLongerManual.html>

OR

- 2) Field, A. (2013). *Discovering statistics using SPSS* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Course Objectives

By the end of the course the student should have demonstrated the ability to:

1. learn how to use statistics to address research questions and make sure that all conclusions are justified and within the scope of the data (i.e., any conclusions are supported by the statistical analysis).
2. identify continuous and discrete (or categorical) variables as either dependent or independent, and choose appropriate statistical procedures for their analysis;
3. describe relationships between predictor variables and a continuous outcome variable;
4. formulate one- and two-factor between-groups analysis-of-variance models, estimate their parameters, and test hypotheses about those parameters; including
 - a. identify situations in which it is correct to apply,
 - b. identify the assumptions underlying parametric ANOVA,
 - c. differentiate between fixed and random effects models,
 - d. identify situations in which various transformations are appropriate for ANOVA,
 - e. compute and interpret effect size indicators for the analysis of variance.
4. design and implement tests of specific a priori and post hoc contrasts in the context of analysis of variance models; specifically
 - a. identify and differentiate between comparison and familywise error rates,
 - b. describe when a priori and post hoc comparisons are appropriate,
 - c. compute planned and post hoc comparison procedures, and
 - d. identify the various post hoc comparison procedures (e.g., Tukey's HSD and Scheffe test), and conditions wherein each procedure is appropriate.
5. calculate point estimates, confidence intervals and hypothesis tests for regression slopes;
6. delineate assumptions of linear statistical models and examine data to evaluate their conformity to those assumptions;
7. formulate and interpret multiple regression models appropriate for various research problems and interpret computer output relevant to those models;
8. think about the regression analysis in matrix form;
9. recognize similarities and differences between regression and analysis-of-variance models;
10. understand the roles of error terms in linear models;
11. write coherent summaries and interpretations of data analyzed by the above procedures.

Evaluation

Grades will be based on points accumulated on the homework and examinations. There will be 100 total possible points, distributed as follows:

Homework assignments	50%
Midterm exam (scheduled time only)	20%
Final exam (scheduled time only)	20%
Quizzes	10%

The grade ranges in terms of percentages are:

100.0-92.0 = A	87.9-84.0 = B+	74.9-72.0 = C+	64.9 and below = F
91.9-88.0 = A-	83.9-80.0 = B	71.9-70.0 = C	
	79.9-75.0 = B-	69.9-65.0 = C-	

Homework

Six homework assignments will make up the points devoted to homework. The assignments are not all equal in length. Total homework points will be converted to a percentage score, then weighted and combined with exam scores to obtain a final overall grade. You are encouraged to discuss the homework assignments with other students in the class, but each student must separately write up her or his own answers and turn and turn in a copy by the due data.

Each person is given a total of six (6) late days that can be used throughout the semester without any consequence to the final grade. No late days can be used on the last assignment so the answer key, which will be provided for each HW, can be posted in time for the purpose of preparing for the final exam. If more than 6 late days are accumulated, it will affect your final course grade, as described below.

<u>Number of late days</u>	<u>Consequences</u>
0-6	None
6-8	Marginal grades will be graded down
8-10	Downgrade one level on final grade (e.g., A reduced to A-)
10+	Downgrade two levels on final grade (e.g., A reduced to B+)

Late homework should be turned in during business hours to the faculty mail box on the 11th floor at the Lewis Tower campus.

If you would like to appeal any grade after your HW is graded, you must make the appeal in writing and submit it along with the graded HW to the instructor.

Examinations

There are two exams for this course. The exams are open-book and open-note, and you may use calculators during the exam. However, books, notes, and calculators may not be shared or circulated during exams, so be sure to bring your own materials.

Quizzes

Two to three pop quizzes will be

Attendance

Regular attendance and participation in class discussions are expected. Contact the instructor ahead of the class meeting if you cannot attend the class.

Dispositions

Each course in the School of Education focuses on one or more professional dispositions. Students are offered opportunities to receive feedback on their dispositional growth in the areas of professionalism, fairness and/or the belief that all students can learn. The expected behaviors for the specific dispositions for this class and the evaluation rubric are listed in the end of this syllabus.

IDEA Objectives

IDEA is an evaluation system that our School uses to assess whether a class reaches its major goals by the end of the semester. The essential objectives for this course are:

1. Gaining a basic understanding of the subject (e.g., factual knowledge, methods, principles, generalizations, theories)
2. Learning to apply course material (to improve thinking, problem solving, and decisions)
3. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course

Loyola University Chicago
School of Education
Syllabus Addendum

IDEA Course Evaluation Link for Students

Each course you take in the School of Education is evaluated through the IDEA Campus Labs system. We ask that when you receive an email alerting you that the evaluation is available that you promptly complete it. To learn more about IDEA or to access the website directly to complete your course evaluation go to: <http://luc.edu/idea/> and click on *STUDENT IDEA LOGIN* on the left hand side of the page.

Dispositions

All students are assessed on one or more dispositional areas of growth across our programs: *Professionalism, Fairness, and the Belief that All Students Can Learn*. The instructor in your course will identify the dispositions assessed in this course and you can find the rubrics related to these dispositions in LiveText. Disposition data is reviewed by program faculty on a regular basis. This allows faculty to work with students to develop throughout their program and address any issues as they arise.

LiveText

All students, except those who are non-degree, must have access to LiveText to complete the benchmark assessments aligned to the Conceptual Framework Standards and all other accreditation, school-wide and/or program-wide related assessments. You can access more information on LiveText here: [LiveText](#).

Syllabus Addendum Link

- www.luc.edu/education/syllabus-addendum/

This link directs students to statements on essential policies regarding *academic honesty, accessibility, ethics line reporting* and *electronic communication policies and guidelines*. We ask that you read each policy carefully.

This link will also bring you to the full text of our conceptual framework that guides the work of the School of Education – *Social Action through Education*.

Tentative schedule

Week	Date	Topic	Readings	Slides	Due
1	8/29	Review of correlation and begin simple linear regression	Ch. 9	1	
2	9/5	~ ~ ~ Labor Day: No Class ~ ~ ~			
3	9/12	Simple linear regression/Multiple linear regression I	Ch. 9	2	
4	9/19	Multiple linear regression I: Continuous predictors	Ch. 15	3	HW1
5	9/26	Multiple linear regression II: Categorical and continuous predictors	Ch. 15	4	
6	10/3	Multiple linear regression III: Interactions	Ch. 15	5	
7	10/10	~ ~ ~ Fall Break: No Class ~ ~ ~			
8	10/17	<ul style="list-style-type: none"> • Multiple linear regression (R^2 Change) • Multiple linear regression (Multicollinearity) 	-Ch. 7 -Ch. 7	-6 -7	HW2
9	10/24	Simple analysis of variance (ANOVA)	Ch. 11	8	HW3
10	10/31	~ ~ ~ Exam 1 ~ ~ ~			
11	11/7	Multiple comparisons I	Ch. 12	9	HW4
12	11/14	Factorial analysis of variance II	Ch. 13	10	
13	11/21	Factorial analysis of variance II	Ch. 13	11	HW5
14	11/28	Analysis of covariance (ANCOVA)	Ch. 16	12	
15	12/5	Review			HW6
16	12/12	~ ~ ~ Exam 2 ~ ~ ~			

Evaluation of Disposition in RMTD 482

Rubric

Area	Target	Acceptable	Unacceptable
Systematic Inquiry IL-LUC-DISP.1	Candidate communicates effectively and appropriately with faculty and peers.	Candidate is working on communicating effectively and appropriately with faculty and peers.	Candidate is unable to communicate effectively and appropriately with faculty and peers.
Responsibilities for General and Public Welfare IL-LUC-DISP.1	Candidate's written work is appropriate and effective for the course.	Candidate's written work is sometimes appropriate and effective for the course.	Candidate's written work is inappropriate and ineffective for the course.
Timeliness IL-LUC-DISP.1	Candidate is able to meet all deadlines.	Candidate is sometimes able to meet all deadlines.	Candidate is unable to meet all deadlines.
Accountability IL-LUC-DISP.1	Candidate attends all classes and fulfills all professional obligations.	Candidate sometimes attends classes and fulfills professional obligations.	Candidate's attendance to class is inconsistent and is unable to fulfill all professional obligations.
Collegiality IL-LUC-DISP.1	Candidate is able to work with peers.	Candidate sometimes respects the viewpoints of others.	Candidate has difficulty respecting the viewpoints of others.
Integrity/Honesty IL-LUC-DISP.2	Candidate respects the viewpoints of others.	Candidate sometimes respects the viewpoints of others.	Candidate has difficulty respecting the viewpoints of others.
Interpersonal Integrity/Honesty IL-LUC-DISP.2	Candidate recognizes potential conflicts and handles them appropriately.	Candidate sometimes recognizes potential conflicts and handles them appropriately.	Candidate has difficulty recognizing potential conflicts and handling them appropriately.
Academic Integrity/Honesty IL-LUC-DISP.2	Candidates appropriately represent procedures, data, and findings – attempting to prevent misuse of their results.	Candidates represent procedures, data, and findings in a manner that is likely to allow the misuse of their results.	Candidates misrepresent procedures, data, and findings. There is minimal attempt to prevent misuse of their results.