

RMTD 421 Building a Body of Evidence Using Quantitative Methods

Spring 2011

Course Time: TH 4:15 – 6:45 PM

Location: 410 Lewis Towers

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Office Hours: By appointment

Course Description

This course explores the discipline and practice of quantitative research. It introduces students to theories, traditions and components of this form of inquiry. The course will integrate basic design principles of quantitative research with commonly used statistical methods for analyzing data from these designs. The designs covered in the course include experimental and quasi-experimental studies, observational studies, and basic survey sample principles. The course will focus on the inferential statistical methods of ANOVA and simple regression. Students are expected to have successfully completed a course in elementary statistics either at the undergraduate or graduate level.

School of Education's Conceptual Framework

The School of Education at Loyola University Chicago, a Jesuit and Catholic urban university, supports the Jesuit ideal of knowledge in the service of humanity. We endeavor to advance professional education in the service of social justice, engaged with Chicago, the nation, and the world. To achieve this vision the School of Education participates in the discovery, development, demonstration, and dissemination of professional knowledge and practice within a context of ethics, service to others, and social justice. We fulfill this mission by preparing professionals to serve as teachers, administrators, psychologists, and researchers; by conducting research on issues of professional practice and social justice; and by partnering with schools and community agencies to enhance life-long learning in the Chicago area. This course will equip students with the knowledge, skills of inquiry, and ethics necessary to be professional and socially just researchers. The data sets and case studies used in this course illustrate how statistical analysis can illuminate issues of social justice such as inequality in resources and achievement across segments of our society. In addition, the statistical techniques used in this course also add to students' ability to understand the diversity of perspectives that researchers use to address social problems.

School of Education Conceptual Framework Standards

This course will assess the following SOE Conceptual Framework Standards:

CF1 – Candidates demonstrate an understanding of a current body of literature and are able to critically evaluate new practices and research in their field.

CF7 – Candidates demonstrate how moral and ethical decisions shape actions directed toward service to others.

CF8 – Candidates apply ethical principles in professional decision-making.

Required texts:

Howell, D. C. (2009). *Statistical methods for psychology* (7th ed.). Wadsworth. ISBN-10: 0495012874 ISBN-13: 9780495012870

Shadish, W., Cook, T. & Campbell, D. (2001). *Experimental and quasi-experimental research designs* (2nd ed.). Houghton-Mifflin. ISBN-10: 0395615569 ISBN-13: 978-0395615560

Recommended Texts:

Green, S. & Salkind, N. J. (2008). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (5th ed.). Prentice Hall. ISBN-10: 0131890255 ISBN-13: 978-0131890251

Educational Goals: As a result of this course, students will be able to:

1. Understand and explain the four primary dimensions of validity:
 - a. Statistical Conclusion Validity
 - b. Internal Validity
 - c. External Validity

d. Construct Validity

2. Understand and explain the major quasi-experimental designs for social and behavioral research:

- a. Designs with and without pretest and with and without control groups
- b. Interrupted time series designs
- c. Regression discontinuity designs

3. Understand and explain the randomized experiment

4. Understand and explain generalized causal inference and how experiments may best be designed to facilitate this

- a. Explain the three conditions are needed for causation and explain Rubin's concept of the counterfactual
- b. Methods for counter balancing in repeated measures designs to increase validity of design

5. For each of the above (Designs with and without pretest and control conditions; Interrupted time series; Regression discontinuity; and Randomized experiments)

- a. Explain the logic of each design
- b. Explain how each design approximates the counterfactual
- c. Explain how each design tries to address the three conditions of causation
- d. Describe the strengths and weakness of each design
- e. Describe how to interpret the results of each

6. Understand and implement the basic statistical techniques needed to analyze data from experimental and quasi-experimental research

a. Statistical Power

- i. Describe the relationship between the variables that influence power (N, effect size, alpha level)
 - ii. Explain the relationship between Type I and Type II errors and variables related to power
 - iii. Explain the concepts of type I error rate per comparison (PC) experimental wise (EW) and family wise (FW)

b. The general linear model

- i. Explain the concept of General Linear model
- ii. Identify and describe components of Basic GLM equation
- iii. Describe the variables that underlie the GLM: Linearity and Additivity
- iv. List statistical assumptions underlying the GLM and the special cases of the GLM
- v. Explain how to check for violations of the GLM assumptions
- vi. Calculate the effect size for different forms of the GLM

b. Multiple regression

- i. Explain logic of MR and its use in predictive and explanatory research
- ii. Types of data used
- iii. Write GLM equation
- iv. Using SPSS to run analysis
- v. Write null and alternative hypothesis
- vi. Explain partial and semi-partial correlations
- vii. Methods for comparing the relative importance of independent variables in multiple regression
- viii. Curvilinear relationships
 - ix. Explain the concept of multicollinearity and the indicators of it including the concept of tolerance.

c. Two-way analysis of variance (ANOVA)

- i. Explain logic of 2-way ANOVA and Cell structure
- ii. Types of data used
- iii. Write GLM equation
- iv. Using SPSS to run analysis
- v. Write null and alternative hypothesis
- vi. Explain Main effects

vii.Explain Interaction effects

d.Analysis of covariance (ANCOVA)

- i.Explain logic and Cell structure
- ii.Types of data used
- iii.Write GLM equation
- iv.Using SPSS to run analysis
- v.Write null and alternative hypothesis
- vi.Explain how ANCOVA provides statistical control

Course requirements: During the course of the semester, students will complete the following assignments.

Reflection Papers: Students will be assigned one article to critically review throughout this semester. Guidelines for the critical reviews will be provided in class. The second paper will center on ethical issues in experimental studies

Homework Assignments: Students will have four homework assignments. These homework assignments will involve the use of SPSS and or R to analyze a set of data and write up the results using the correct APA format style.

Group Presentations: This assignment will bolster your quantitative design knowledge and will provide your group an opportunity to enhance class discussion on research design. Details about this project will be discussed in class.

Mid term and Final exams: You will have a midterm and a final exam. The chapters related to the exams are listed on the course calendar.

Participation: Class participation includes but is not limited to, attending class, completing all reading assignments before coming to class, actively participating in class activities and discussions, asking and answering questions, listening to and respecting the views, thoughts, and opinions of your classmates.

- One page Vitae- As part of your participation grade you must submit a one page vitae. Your vitae must provide information about your future career goals, educational history, work history and how you like to spend your leisure time.

Point break down:

Final	20%
Midterm	20%
Group Project	10%
Homework Assignments (4)	15%
Critical Reflection Paper	15%
Ethical Reflection Paper	10%
Class participation	10%

Assignment Due Dates: Due dates for assignments are listed on the course calendar. Please note that the first reflection paper will serve as an assessment of the School of Education Conceptual Framework Standard 1: Knowledge of research. The rubric for assessing CF1 is attached to the end of this syllabus. The ethical reflection paper will serve as an assessment of the School of Education Conceptual Framework Standards 7 and 8. The rubric for this assessment is attached at the end of the syllabus.

Course Expectations

I perceive each of you as students, learners and scholars. As such, I expect that you view yourself in the same manner. You have chosen to be here and therefore are responsible for our own behavior, learning, and success. However, as a group we make up a class and as such are scholarly community. In order to succeed as individuals and as a group we must be willing to agree to the following set of expectations:

Attendance and participation: Students are expected to attend all classes and to participate fully in their activities. Professionalism includes being present, on time, prepared, and engaged. If you must be absent from class because of illness or emergency, please leave a message for the instructor in advance.

Late work: Late work is **not acceptable** unless *prior* arrangements have been made with the instructor. Late assignments will automatically be worth only half of their original point value.

Tentative Course Calendar/Schedule of Topics

Date/Day	Activities	Topics	Readings*	Assignments Due**
Jan 20 Thurs	SPSS Review	1. Syllabus Review 2. Review of Inferential Stats 3. Philosophy of Causation	SCC Preface	
Jan 27 Thurs	Power Analysis G*Power R	1. Introduction to Statistical Conclusion and Internal Validity 2. GLM 3. Power	SCC 1 & 2 Howell Ch. 8 Cohen (on BB)	Philosophy of Science and Research Paper
Feb 3 Thurs	Regression SPSS R	1. Construct and External Validity 2. GLM & Multiple Regression	SCC 2 & 3 Howell, Ch.15 (Ch. 9 if need review)	
Feb 10 Thurs	ANOVA SPSS R	1. Quasi-Experimental Design (no pretest and no control) 2. ANOVA	SCC, Ch. 4 EEPA article (on BB) Howell, Ch. 11 & 16	Regression homework
Feb 17 Thurs	First Group Presentation	1. Quasi-Experimental Design (with pretest and control) 2. Multiple Comparisons	SCC Ch. 5 Polit & Sherman (handout) Cohen (on BB) Howell Ch. 12	ANOVA homework
Feb 24 Thurs	Second Group Presentation	1. Regression Discontinuity Designs 2. Interrupted time Series Designs	SCC, Chs. 6 & 7	
Mar 3 Thurs	Mid-term			
Mar 11 - Spring Break				
Mar 17 Thurs	Third Group Presentation	1. RDD (continued) 2. Randomized Experiments 3. Ethical issues in experiments	SCC Ch. 8	
Mar 24 Thurs		1. Practical Problems with Experimental and Quasi-Experimental Studies 2. Two-way ANOVA/ANCOVA	SCC Chs. 9 & 10 Howell, Ch. 13 & 16 New Yorker article (on BB)	Reflection paper: Ethics in experiments
March 31 Thurs	Fourth Group Presentation	1. Generalized Causal Inference I 2. Single-Case Designs	SCC Chs. 11	Reflection paper: Randomized Experiment
April 7 Thurs	Fifth Group Presentation	1. Generalized Causal Inference II 2. Methods for Causal Explanation	SCC Ch. 12	ANCOVA homework

April 14 Thurs	Sixth Group Presentation SPSS Repeated Measures	1. Repeated-measures design & analysis 2. Cluster Randomization	Howell, Ch. 14	
April 21 Thurs NO CLASS	EASTER BREAK			
April 28 Thurs	Seventh Group Presentation	1. Methods for Multiple Studies: Introduction to Meta-Analysis 2. Assessment of Our Assumptions & Ethics 3. Review	SCC, Chs. 13 & 14	Repeated Measures Homework
May 6 Thurs	Final Exam			
This is a tentative schedule and is subject to change throughout the semester.				

* Reading must be completed prior to coming to class on scheduled date

** Assignments will be handed in using Blackboard

University Policy:

Academic Honesty

Academic honesty is an expression of interpersonal justice, responsibility and care, applicable to Loyola University faculty, students, and staff, which demands that the pursuit of knowledge in the university community be carried out with sincerity and integrity. The School of Education’s Policy on Academic Integrity can be found at:

http://www.luc.edu/education/academics_policies_integrity.shtml. For additional academic policies and procedures refer to: http://www.luc.edu/education/academics_policies_main.shtml

Accessibility

Students who have disabilities which they believe entitle them to accommodations under the Americans with Disabilities Act should register with the Services for Students with Disabilities (SSWD) office. To request accommodations, students must schedule an appointment with an SSWD coordinator. Students should contact SSWD at least four weeks before their first semester or term at Loyola. Returning students should schedule an appointment within the first two weeks of the semester or term. The University policy on accommodations and participation in courses is available at:

<http://www.luc.edu/sswd/>

Harassment (Bias Reporting)

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of his or her race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior threatens to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational and health care mission. For this reason, every incident of harassment, discrimination or abuse undermines the aspirations and attacks the ideals of our community. The university qualifies these incidents as incidents of bias.

In order to uphold our mission of being Chicago's Jesuit Catholic University-- a diverse community seeking God in all things and working to expand knowledge in the service of humanity through learning, justice and faith, any incident(s) of bias must be reported and appropriately addressed. Therefore, the Bias Response (BR) Team was created to assist members of the Loyola University Chicago community in bringing incidents of bias to the attention of the university. If you believe you are subject to such bias, you should notify the Bias Response Team at this link: <http://webapps.luc.edu/biasreporting/>

Technology and Statistical Computing

While no previous programming experience is assumed, we will be using SPSS and R to carry out the relevant analyses in this course. Students are highly encouraged to use this semester as an opportunity to learn the basics of R for statistical analyses (especially those students majoring in Research Methodology). We will provide auxiliary instructional materials for everyone on the basics of R and how to carry out the various analyses.

You are expected to know how to navigate the university's email system as well as Blackboard. Course materials will be stored on Blackboard as well as special announcements. I will assume your university email account to be your primary email account (and this is where Blackboard announcements will be sent).

Diversity

This course and your programs are committed to diversity including but not limited to race, gender, sexual orientation, social class, ethnicity, and ability. Through this course, you will learn how to effectively interpret and critique fundamental quantitative methods used in the social sciences. You will be provided with an introductory set of quantitative tools necessary to investigate (and evaluate the research of) the social dimensions mentioned above.

**Research Methodology Program
Core Assessment**

Course: RMTD 421 – Educational Research II
 Core Assessment: Research article critique
 CF Standard: 1

For this core assessment, each student will identify a research article using one of the following research designs: randomized experiment, quasi-experiment, repeated measures, or regression discontinuity. This purpose of this assessment is to demonstrate an understanding of the rationale and application of the research design to address an educational problem. Students are expected to include both a summary and a critical review of the article that discusses the following elements:

- 1.Units, Treatments, Observation(s) and Setting (UTOS)
- 2.The representation of the counter factual
- 3.The construct being studied and how the construct is defined and operationalized
- 4.Variables involved in the study (IV(s) DV(s) and confounding variables)
- 5.The alternative explanations (third variable alternative) appropriate to the research design
- 6.The causal explanations tested in the study

Core Assessment Rubric

Conceptual Framework Standard	Target	Acceptable	Unacceptable
CF1: Candidates demonstrate an understanding of a current body of literature and are able to critically evaluate new practices and research in their field.	The research article critique clearly defines the research question, rationale, context design, results and limitations of the study. The research paper weaves together the summary and analysis of the article supporting claims with sufficient evidence from the article.	The research article critique demonstrates a good understanding of the research question, rationale, context design, results and limitations of the study. The research paper attempts an integration of the summary and analysis with some evidence provided for claims.	The research article critique presents a limited understanding of the research question, rationale, context design, results and limitations of the study. The research paper does not successfully integrate the summary and analysis of the article, and/or provides little supporting evidence for claims.

**Research Methodology PhD Program
Core Assessment**

Course: RMTD 421 – Educational Research II
 Core Assessment: Essay on research ethics
 CF Standards: 7 and 8

For this core assessment, the student will read an article or case study provided by the instructor that addresses an aspect of research ethics.

Core Assessment Rubric

Conceptual Framework Standard	Target	Acceptable	Unacceptable
CF7: Candidates demonstrate how moral and ethical decisions shape actions directed toward service to others.	The essay presents a clear and well-reasoned argument for decisions made in a research study involving human subjects.	The essay provides an adequate argument for the decisions made in a research study involving human subjects with some claims not clearly addressed or supported.	The essay demonstrates a limited understanding of the issues involved in research with human subjects, and provides little or no support for its claims.
CF8: Candidates demonstrate an understanding of the major principles of research ethics in research with human subjects.	The essay clearly represents an understanding of the principles of the Belmont report: respect for persons, beneficence, and justice. The essay assesses the ethical issues present in the case study, and provides a clear and well-supported argument for its claims.	The research article critique demonstrates a good understanding of the principles of the Belmont report: respect for persons, beneficence, and justice. The essay addresses some of the ethical issues present in the case study, and provides some support for its claims.	The research article critique presents a limited understanding of the principles of the Belmont report: respect for persons, beneficence, and justice. The essay partially addresses the ethical issues present in the case study, and provides little or no support for its claims.