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:


Recommended Texts:

General Course Objectives
1. Gaining factual knowledge (terminology, classifications, methods, trends)
2. Learning to apply course material (to improve thinking, problem solving, and decisions)
3. Learning how to find and use resources for answering questions or solving problems
4. Learning to analyze and critically evaluate ideas, arguments, and points of view
**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 counter factual
   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 counter factual
   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
   b. Describe the relationship between the variables that influence power (N, effect size, alpha level)
   c. Explain the relationship between Type I and Type II errors and variables related to power
   d. Explain the concepts of type I error rate per comparison (PC) experimental wise (EW) and family wise (FW)
7. General linear model
   a. Explain the concept of General Linear model
   b. Identify and describe components of Basic GLM equation
   c. Describe the variables that underlie the GLM: Linearity and Additivity
   d. List statistical assumptions underlying the GLM and the special cases of the GLM
   e. Explain how to check for violations of the GLM assumptions
   f. Calculate the effect size for different forms of the GLM
8. Multiple regression
   a. Explain logic of MR and its use in predictive and explanatory research
   b. Types of data used
   c. Write GLM equation
   d. Using SPSS to run analysis
   e. Write null and alternative hypothesis
   f. Explain partial and semi-partial correlations
   g. Methods for comparing the relative importance of independent variables in multiple regression
   h. Curvilinear relationships
   i. Explain the concept of multicollinerarity and the indicators of it including the concept of tolerance.
9. Two-way analysis of variance (ANOVA)
   a. Explain logic of 2-way ANOVA and Cell structure
   b. Types of data used
   c. Write GLM equation
   d. Using SPSS to run analysis
   e. Write null and alternative hypothesis
   f. Explain Main effects
   g. Explain Interaction effects
10. Analysis of covariance (ANCOVA)
    a. Explain logic and Cell structure
b. Types of data used
c. Write GLM equation
d. Using SPSS to run analysis
e. Write null and alternative hypothesis
f. 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.

Midterm and Final exams: The chapters related to the midterm and final 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. In addition, the following brief documents are included in participation:

- One page Vite: Please provide information about: your future career goals, educational and work history and how you like to spend your leisure time.
- Philosophy of Science: One page description of your views on science. What theory (theories...if any) resonate with you and why?

Possible Extra Credit: Research Symposium: One page discussion of a study's validity issues, methodology and analysis.

Point break down:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Final</td>
<td>20%</td>
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<tr>
<td>Midterm</td>
<td>20%</td>
</tr>
<tr>
<td>Group Project</td>
<td>10%</td>
</tr>
<tr>
<td>Homework Assignments (4)</td>
<td>15%</td>
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<tr>
<td>Critical Reflection Paper</td>
<td>15%</td>
</tr>
<tr>
<td>Ethical Reflection Paper</td>
<td>10%</td>
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<tr>
<td>Class participation</td>
<td>10%</td>
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</table>

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 considered late if submitted after the date and time due and 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

<table>
<thead>
<tr>
<th>Date/Day</th>
<th>Activities</th>
<th>Topics</th>
<th>Text Readings*</th>
<th>Assignments Due**</th>
</tr>
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</table>
| Jan 15 Weds | SPSS Review | 1. Syllabus Review  
2. Course Overview  
3. Philosophy of Causation  
4. Review of Inferential Statistics | SCC, Preface, Ch. 1 Field, Preface, How to Use This Book, Ch. 1 (1.1-1.5) | |
| Jan 22 Weds |  | 1. Statistical Conclusion and Internal Validity  
2. GLM  
3. Power | SCC, Ch. 1 & 2 | Philosophy of Science and Research Paper One-Page Vitae |
| Jan 29 Weds | Regression: SPSS | 1. Construct and External Validity  
2. Multiple Regression | SCC, Ch. 2 & 3 Field, Ch. 8 | |
| Feb 5 Weds | ANOVA: SPSS | 1. Quasi-Experimental Design (no pretest and no control)  
2. ANOVA | SCC, Ch. 4 Field, Ch. 11 | Regression homework |
| Feb 12 Weds | First Group Presentation | 1. Quasi-Experimental Design (with pretest and control)  
2. Multiple Comparisons | SCC Ch. 5 Field, Ch. 11 | ANOVA homework |
| Feb 19 Weds | Second Group Presentation | 1. Regression Discontinuity Designs  
2. Interrupted time Series Designs | SCC, Ch. 6 & 7 | |
| Feb 26 Weds | Mid Term | | | |
| March 5 Weds | Spring Break | NO CLASS | | |
| March 12 Weds | Third Group Presentation | 1. RDD (continued) Randomized Experiments  
2. Ethical issues in experiments | SCC, Ch. 8 | |
| March 19 Weds | Fourth Group Presentation | 1. Practical Problems with Experimental and Quasi-Experimental Studies  
2. Two-way ANOVA/ANCOVA | SCC, Ch. 9 & 10 Field, Ch. 12 & 13 | Reflection paper: Ethics in experiments |
<p>| March 26 Weds | EASTER BREAK Week (Online) | 1. Methods for Multiple Studies: Introduction to | SCC, Ch. 13 &amp; 14 | ANCOVA homework |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Group</th>
<th>Presentation</th>
<th>Meta-Analysis</th>
<th>Reflection paper:</th>
</tr>
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</table>
| April 2   | Fifth Group | 1. Generalized Causal Inference I  
2. Generalized Causal Inference II  
3. Methods for Causal Explanation | SCC, Ch. 11                                         | Randomized Experiment                                      |
| Weds      | Presentation|                                                       |                                                     |                                                           |
| April 9   | Sixth Group | 1. Repeated-measures design & analysis  
2. Cluster Randomization | SCC, Ch. 12                                         |                                                           |
| Weds      | Presentation|                                                       | Field, Ch. 14                                       |                                                           |
| April 16  | Repeated    | 1. Assessment of Our Assumptions & Ethics  
2. Review                                           |                                                     | Repeated Measures Homework                                  |
| Meas: SPSS Seventh Group |                                                        |                                                     |                                                           |
| Presentation |                                                       |                                                     |                                                           |
| April 30  | Final Exam  |                                                       |                                                     |                                                           |
| Weds      |                                                        | 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 Sakai

**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 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 SPSS for statistical analyses (especially those students majoring in Research Methodology).

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

Responsible Conduct in Research and Scholarship (RCRS)

Loyola University Chicago is committed to ensuring that all its faculty and students have the opportunity to be properly trained in the ethical and responsible conduct of research and scholarly integrity and are held to the highest possible ethical standards. In order to ensure each faculty and student at Loyola has the basic foundation needed to learn and apply the ethical standards of their discipline/profession, he or she is encouraged to complete or register for the no-credit Responsible Conduct in Research and Scholarship course (UNIV 370) prior to involvement in funded research activity involving the NSF, NIH, or any other federal agency requiring training. Beginning Fall 2011, the Graduate School is requiring RCRS training for all matriculating PhD students and master’s students enrolled in thesis-oriented programs. Graduate Program Directors in non-thesis master’s programs may recommend RCRS training for their students.

For purposes of applying this policy, research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activities. Typically, thesis and dissertation projects required by an academic program to receive a degree are considered research activities.

School of Education master’s students who have completed RMTD 400 – Introduction to Research Methodologies and received a grade of B or higher have fulfilled the requirement for RCRS training. School of Education doctoral students who have completed the two-course sequence, RMTD 420 and RMTD 421, and received a grade of B or higher in both courses have fulfilled the requirement for RCRS training. School of Education students who do not meet these requirements will need to complete the UNIV 370 course. More information about the RCRS policy can be found here: http://www.luc.edu/ors/RCRHome.shtml.

Dispositions

The dispositions, Professionalism, Fairness, and the Belief that all students can learn, are indicators of growth for different levels in the program. Students in all courses are assessed in one or more of these indicators in order to track growth as candidates progress through their programs. The dispositions listed below are the expectations of the developmental disposition standards for students at your level. The three areas of dispositions listed above will be assessed in this course.
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

<table>
<thead>
<tr>
<th>Conceptual Framework Standard</th>
<th>Target</th>
<th>Acceptable</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF1: Candidates demonstrate an understanding of a current body of literature and are able to critically evaluate new practices and research in their field.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Conceptual Framework Standard</th>
<th>Target</th>
<th>Acceptable</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF7: Candidates demonstrate how moral and ethical decisions shape actions directed toward service to others.</td>
<td>The essay presents a clear and well-reasoned argument for decisions made in a research study involving human subjects.</td>
<td>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.</td>
<td>The essay demonstrates a limited understanding of the issues involved in research with human subjects, and provides little or no support for its claims.</td>
</tr>
<tr>
<td>CF8: Candidates demonstrate an understanding of the major principles of research ethics in research with human subjects.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
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</table>
## Research Methodology PhD Program
### Disposition Assessment

**Course:** RMTD 421 – Educational Research II  
**Dispositions:** Professionalism, Fairness, All Students Can Learn

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Target</th>
<th>Acceptable</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic Inquiry IL-LUC-DISP.1</td>
<td>Candidate communicates effectively and appropriately with faculty and peers.</td>
<td>Candidate is working on communicating effectively and appropriately with faculty and peers.</td>
<td>Candidate is unable to communicate effectively and appropriately with faculty and peers.</td>
</tr>
<tr>
<td>Responsibilities for General and Public Welfare IL-LUC-DISP.1</td>
<td>Candidate’s written work is appropriate and effective for the course.</td>
<td>Candidate’s written work is sometimes appropriate and effective for the course.</td>
<td>Candidate’s written work is inappropriate and ineffective for the course.</td>
</tr>
<tr>
<td>Timeliness IL-LUC-DISP.1</td>
<td>Candidate is able to meet all deadlines.</td>
<td>Candidate is sometimes able to meet all deadlines.</td>
<td>Candidate is unable to meet all deadlines.</td>
</tr>
<tr>
<td>Accountability IL-LUC-DISP.1</td>
<td>Candidate attends all classes and fulfills all professional obligations.</td>
<td>Candidate sometimes attends classes and fulfills professional obligations.</td>
<td>Candidate’s attendance to class is inconsistent and is unable to fulfill all professional obligations.</td>
</tr>
<tr>
<td>Collegiality IL-LUC-DISP.1</td>
<td>Candidate is able to work with peers.</td>
<td>Candidate sometimes respects the viewpoints of others.</td>
<td>Candidate has difficulty respecting the viewpoints of others.</td>
</tr>
<tr>
<td>Integrity/Honesty IL-LUC-DISP.2</td>
<td>Candidate respects the viewpoints of others.</td>
<td>Candidate sometimes respects the viewpoints of others.</td>
<td>Candidate has difficulty respecting the viewpoints of others.</td>
</tr>
<tr>
<td>Interpersonal Integrity/Honesty IL-LUC-DISP.2</td>
<td>Candidate recognizes potential conflicts and handles them appropriately.</td>
<td>Candidate sometimes recognizes potential conflicts and handles them appropriately.</td>
<td>Candidate has difficulty recognizing potential conflicts and handling them appropriately.</td>
</tr>
<tr>
<td>Academic Integrity/Honesty IL-LUC-DISP.2</td>
<td>Candidates appropriately represent procedures, data, and findings – attempting to prevent misuse of their results.</td>
<td>Candidates represent procedures, data, and findings in a manner that is likely to allow the misuse of their results.</td>
<td>Candidates misrepresent procedures, data, and findings. There is minimal attempt to prevent misuse of their results.</td>
</tr>
<tr>
<td>Maximizing Benefits &amp; Reducing Harm IL-LUC-DISP.3</td>
<td>Candidate understands the cost-benefit ratio of particular research designs for addressing important research questions.</td>
<td>Candidate sometimes understands the cost-benefit ratio of particular research designs for addressing important research questions.</td>
<td>Candidate does not understand the cost-benefit ratio of particular research designs for addressing important research questions.</td>
</tr>
<tr>
<td>Social Equity IL-LUC-DISP.3</td>
<td>Candidate demonstrates appropriate empathy for others.</td>
<td>Candidate sometimes demonstrates appropriate empathy for others.</td>
<td>Candidate has difficulty demonstrating appropriate empathy for others.</td>
</tr>
<tr>
<td>Respectful Communication IL-LUC-DISP.3</td>
<td>Candidate communicates research in a manner that respects stakeholders’ dignity and self-worth.</td>
<td>Candidate attempts to communicate research in a manner that respects stakeholders’ dignity and self-worth.</td>
<td>Candidate makes no clear efforts to communicate research in a manner that respects stakeholders’ dignity and self-worth.</td>
</tr>
<tr>
<td>Respect for People IL-LUC-DISP.3</td>
<td>Candidate respects differences when planning, conducting, analyzing, and</td>
<td>Candidate attempts to respect differences when planning, conducting, analyzing, and</td>
<td>Candidate does not respect differences when planning, conducting, analyzing, and</td>
</tr>
<tr>
<td>Target</td>
<td>Acceptable</td>
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