APSY-UE 25

RESEARCH METHODS I*

Steinhardt School of Culture, Education, and Human Development
New York University

Tuesdays and Thursdays, 9:30-10:45am
4 Washington Pl., Meyer Hall, Room B-02W

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GCASL 284

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1. Objectives

This course seeks to provide students with the skills they need to read, understand, and critically evaluate quantitative research. It is structured around three key questions: (a) what types of questions can we answer with quantitative data?; (b) how can we design studies to answer questions with quantitative data?; and (c) how can we analyze quantitative data? It offers an overview of different study designs, but an important part of the course focuses on randomized experiments. It draws on examples of quantitative research from psychology and economics.

The components of the course aim to achieve different, but complementary, objectives:

- The required readings, to be completed before each lecture, will introduce students to a problem in quantitative research (e.g., how do we choose who should participate in a study?), why it is important (e.g., what happens if we do not have a set of criteria for recruiting participants?), and the approaches that researchers typically employ to solve this problem (e.g., why do researchers use lotteries to select study participants?)

* The official title of the course is "Research Methods in Applied Psychology I". However, on this iteration of the course, its scope will be expanded to include applications to psychology and economics.

- The lectures will briefly review the problem introduced in the readings, discuss its implications in greater detail, and compare and contrast different approaches to solve the problem, drawing extensively on examples from applied research.
- The recitations will allow students to ask clarifying questions about the material covered during lectures and to practice implementing the approaches reviewed in class, often with the help of a statistical package and the support from a course assistant.
- The problem sets, which can be completed in groups, but must be written-up individually, will provide students with opportunities to practice implementing the approaches discussed in lectures and recitations on their own using a statistical package.
- The final (take-home) exam, which must be completed individually, will assess students' ability to apply the material covered in the course independently.

The sequencing of these components (i.e., the fact that students will first complete the readings, then come to lectures, then attend recitations, and then complete the problem sets, leading up to the final exam) aims to provide students with the necessary scaffolding to become critical consumers of quantitative research. By the end of the course, students will be expected to understand the concepts, methods, and analytical strategies covered in the course on their own.

This syllabus draws on previous iterations of the course. The instructor thanks Erin Godfrey and Shabnam Javdani for sharing their materials and allowing him to use them in this course.

2. Pre-requisites

There are two pre-requisites for this course: APSY-UE 10 ("Developmental Psychology") and either PSYCH-UA 10 ("Statistics for Behavioral Sciences") or APSTA-UE 1085 ("Basic Statistics"). Students who have not completed these pre-requisites should notify the instructor *within the first week of class*.

3. Readings

There will be one required text for this course:

- Leary, M. R. (2009). *Introduction to Behavioral Research Methods (6th Edition).* Boston, MA: Pearson.

Note that students will also be required to purchase this book for "Research methods II".

In this iteration of the course, the parts of the book that students will be assigned to read will go back and forth between different chapters. This change has been made to follow the structure of the course around the three key questions outlined in the course objectives. Students are not expected to know concepts that are not covered in the assigned readings. Important concepts explained in parts of the book that have been skipped will be covered later in the course. However, those students who encounter unfamiliar concepts and would like to understand them, even if they are covered later in the course, should e-mail the instructor with questions and/or suggestions on which sections of the book to read.

Any additional readings will be posted to the course site through NYU Classes at: www.nyu.edu/its/classes. Students who are unable to access these readings through the course

site should try to do so through the NYU Libraries system at: http://guides.nyu.edu/arch. If students are still unable to access the readings, they should e-mail the instructor.

4. Grading

This course may be taken for a letter-grade only, not on a satisfactory/no credit basis. Auditing of this course is not allowed; all attendees must be registered students.

Each student's grade in the course will be determined as follows:
a) attendance and punctuality (5%);
b) class participation (15%);
c) six problem sets (50%); and
d) a take-home final (30%).

Attendance and punctuality: Students are expected to attend *all* lessons and recitations. If a student cannot attend a lecture (recitation), he/she should e-mail the instructor (course assistant) at least 24 hours in advance of the lecture (recitation) stating the reason for the absence. If a student missed a lecture (recitation) but was unable to notify the instructor (course assistant) in advance—which is only acceptable in the case of a health condition or emergency—he/she should e-mail the instructor (course assistant) at most 48 hours after the lecture (recitation) stating the reason for the absence. Both planned and unplanned absences will be considered in the 5% of the unadjusted course grade assigned to attendance and punctuality.

Students are expected to arrive *before* the start of each lecture (recitation) to allow the instructor (course assistants) to begin on time. Late arrivals will be considered in the 5% of the unadjusted course grade assigned to attendance and punctuality.

Each student's attendance and punctuality score will be calculated as follows. The student will receive a score of 1 for attending each lecture and recitation and a score of 0 for missing each lecture and recitation. The student will receive a score of 0.75 for arriving late or leaving early. The student's total attendance and punctuality score will be the sum of all the individual scores over the total number of lectures and recitations, multiplied by 100. For example, if a student attended 40 of all 42 sessions (including lectures and recitations), his/her score will be (40/42)*100 or 95. The maximum attendance and punctuality score is 100.

Class participation: During each lecture (recitation), the instructor (course assistants) may call on students to ask them questions related to the required readings. Students are not expected to fully understand the concepts, methods, or analytical strategies introduced in the readings before they are discussed in lecture or recitation, but they are expected to have completed the readings. Therefore, both responses that demonstrate that the students have completed the readings carefully and responses that suggest that students have not completed the readings will be considered in the 15% of the unadjusted course grade assigned to class participation.

Each student's class participation score will be calculated as follows. The student will receive a score of 1 for answering questions correctly, asking clarifying questions, and/or making relevant contributions and a score of 0 for consistently answering questions incorrectly and/or not paying

attention during each lecture and recitation. The student will receive a score of 0.5 if his/her participation is somewhere in between. The student's total participation score will be the sum of all the individual scores over the total number of lectures and recitations, multiplied by 100. For example, if a student met expectations in 38 of all 42 sessions (including lectures and recitations), his/her score will be (38/42)*100 or 90. The maximum participation score is 100.

Problem sets: Students are expected to complete six problem sets throughout the semester. As stated in the course objectives, these problem sets are meant to provide students with opportunities to practice the material covered in lecture and recitations. Students can complete problem sets in groups, but must write up their results individually. Instructions on how to format and submit problem sets will be included at the beginning of each problem set.

Each student's problem sets score will be calculated as follows. The student will receive a score of 0 to 100 on each problem set, based on the proportion of questions he/she answered correctly on the assignment. Partial credit will be awarded for partially-correct answers, so students are encouraged to show their work. The student's overall problem set score will be the average of the five highest problem set scores (i.e., the lowest score will be dropped). This is meant to account for the fact that some students may find some of the problem sets more difficult than others, and to prevent one low problem set score from playing a large role in determining students' overall grade. For example, if a student obtained scores of 90, 80, 100, 50, 100, and 90, his/her score will be (90+80+100+100+90)/5 or 92.

Take-home final exam: Students are expected to complete one final take-home exam. As stated in the course objectives, the exam aims to assess students' ability to apply the material covered in lecture and recitations independently. Students must complete the exam individually. Instructions on the time allotted for and reference materials allowed during the exam will be provided closer to the date.

Each student's final take-home exam score will be calculated as follows. The student will receive a score of 0 to 100 on the exam, based on the proportion of questions he/she answered correctly on the assignment. Partial credit will be awarded for partially-correct answers, so students are encouraged to show their work. That will be the student's score on the final take-home exam. For example, if a student obtained a score of 90, that will be his/her score.

Overall course grade: The overall course grade will be calculated as the weighted average of the attendance and punctuality, class participation, problem sets, and take-home final scores. The weights correspond to the percentages allotted to each score above. For example, if a student obtained a 100 for his/her attendance and punctuality, a 90 for his/her class participation, an 80 for his/her problem sets, and a 70 for his/her take-home final, his/her overall course grade will be (100*0.05)+(90*0.15)+(80*0.5)+(70*0.3) or 79.5. Each student's overall grade may be adjusted based on his/her improvement over time and exemplary performance on one or more dimensions.

The cutoffs for the overall letter grade will be determined based on the distribution of students' performance when mid-term grades are due (on March 30), and revised if needed when final grades are due (on May 13). This is meant to account for the fact that students may find the material more or less difficult than the instructor had originally anticipated. The mid-term and

final grade cutoffs will be posted on the course site. Students must obtain at least a grade of C- to continue on to "Research Methods II".

5. Classroom policies and expectations

Laptops and tablets: Evidence from multiple randomized experiments indicates that students who take notes on their laptops or tablets learn less and earn worse grades than those who take notes using pen/pencil and paper. They are also more likely to adversely affect their peers' learning and grades. (See Prof. Susan M. Dynarski's brief summary of the evidence at: http://brook.gs/2vS6I3e). Therefore, laptop and tablet use is prohibited during lectures and recitations that do not involve statistical programming.

Students are encouraged to either: (a) type up their handwritten notes after class to review and check their understanding of the lessons; or (b) use one of the multiple smartphone apps (e.g., Evernote or OneNote) to take pictures of their handwritten notes and convert them to PDF format. The instructor will also make presentation slides available after each lesson.

Students who wish to request an exception should e-mail the instructor, copying the course assistants, *within the first two weeks of class*. Exceptions will be granted on a case-by-case basis.

Cell phones: Cell phone use (for making or receiving calls, sending or receiving text messages, or recording the lessons) is strictly prohibited during lectures and recitations. There will be no exceptions.

Eating and drinking: No eating is allowed during lectures or recitations. Students may bring water bottles or coffees/teas in a covered container. There will be no exceptions.

6. Statistical programming

Students will need to get access to Stata, a statistical package, to complete the problem sets for this course. All the example code to be provided by the instructor will be written in Stata 14, so students should get access to Stata 14 or above.

Students may get access to Stata on campus, through the computers at Data Services (on the fifth floor of Bobst Library), the Student Technology Centers (LaGuardia Co-op, Kimmel Center Lab, and Third Avenue Lab; see http://bit.ly/2xgqvHg), or the High Performance Computing's Union Square cluster (see http://bit.ly/2xgqvHg).

Students may also get access to Stata off campus through the Virtual Computer Lab at: http://www.nyu.edu//it/vcl.

Finally, students may purchase Stata at a discounted rate through Stata Campus GradPlan at: http://bit.ly/2w1DrCc. Stata/IC, which will be sufficient for this course, is $125 for one year and $225 for a perpetual license.

Lectures will not be used to teach students how to code, but example code will be included in the lecture slides. Recitations will offer students opportunities to practice coding and ask questions.

Additionally, students can seek help with coding from Data Services (on the fifth floor of Bobst Library) either by signing up for their Stata tutorials (see calendar at https://guides.nyu.edu/DS_class_calendar) or by making an appointment for a one-on-one meeting with a consultant (see https://library.nyu.edu/departments/data-services/).

Students who believe that they would benefit from a book on Stata are encouraged to consult:

- Kohler, U. & Keuter, F. (2009). *Data analysis using Stata (2nd Edition)*. College Station, TX: Stata Press.

7. Plagiarism

Students taking this course are expected to have read in full and agreed to NYU-Steinhardt's statement on academic integrity (http://bit.ly/2vSt2JR).

As the statement specifies, "plagiarism is failure to properly assign authorship to a paper, a document, an oral presentation, a musical score and/or other materials, which are not your original work." Therefore, any student who works together with or receives help from others on the problem sets should recognize their contributions appropriately (e.g., using a footnote stating "In collaboration with [First name] [Last name]"). This will help the instructor and the course assistants understand any similarities in assignments turned in by different students.

Students who have questions about what constitutes appropriate collaboration in this course should contact the instructor, copying the course assistants, at least 24 hours before they turn in their problem sets.

If the instructor and/or course assistants suspect that a student has committed plagiarism, disciplinary action may be taken following the department procedure or through referral to the Committee on Student Discipline, through the Office of the Associate Dean for Student Affairs. Please, see the statement on academic integrity for details on the steps involved in each procedure.

8. Accommodations

Any student who needs an accommodation due to a chronic, psychological, visual, mobility and/or learning disability, or who is deaf or hard of hearing, should register with the Moses Center for Students with Disabilities (www.nyu.edu/csd) at 212 998-4980, 726 Broadway, 2nd and 3rd Floors.

Students should also notify the instructor *within the first two weeks of class*. Late requests for accommodation will not be honored except in special circumstances (e.g., injury during the semester).

9. Calendar

This course calendar is tentative. The instructor may adjust the topics to be covered in each class based on how students respond to the material during the semester. Students are expected to check the most updated version of the calendar on the course site before every lecture and recitation.

Part I: What types of questions can we answer with quantitative data?

Date	Topics	Readings[1]	Assignments
Week #1: What is quantitative research?			
Jan 23	• What are the course objectives, components, grading, and classroom policies? • Who are the course instructor and assistants? • What resources are available to students?		Student survey posted
Jan 25	• What are the goals of behavioral research? • What is the scientific approach?	Leary (Ch. 1, pp. 1-9)	Student survey due
Jan 26	• Introduction to Stata		
Week #2: How do we ask and answer questions in quantitative research?			
Jan 30	• What is a theory? • How does a theory inform the formulation of hypotheses?	Leary (Ch. 1, pp. 9-14)	
Feb 1	• How do we operationalize hypotheses? • How do we test hypotheses?	Leary (Ch. 1, pp. 14-27)	
Feb 2	• Practice formulating research questions • Practice formulating hypotheses		
Week #3: What types of questions do we ask in quantitative research? (part 1)			
Feb 6	• What is descriptive research? • What are different types of descriptive research questions?	Leary (Ch. 2, pp. 31-34, 38-41; Ch. 6, pp. 117-123)	
Feb 8	• What is correlational research? • What is the difference between correlation and causation?	Leary (Ch. 7, pp. 140-141; 154-156)	
Feb 9	• Practice answering descriptive and correlational questions through graphs in Stata		
Week #4: What types of questions do we ask in quantitative research? (part 2)			
Feb 13	• What is experimental research? • What are the main steps involved in an experiment?	Leary (Ch. 9, pp. 182-189)	Problem set 1 (graphing data in Stata) posted

[1] The page numbers in this calendar are for the 6th edition of the required text. Page numbers for the 5th and 7th version of the course will be posted on the course site.

Feb 15	• What questions are amenable to descriptive, correlational, and experimental research? • How do descriptive, correlational, and experimental research inform one another?		
Feb 16	• Practice answering experimental questions through graphs in Stata		

Part II: How can we design studies to answer questions with quantitative data?

Date	Topics	Readings	Assignments
Week #5: How can we select participants for a quantitative study?			
Feb 20	• What is the difference between a population, a sampling frame, and a sample? • What are the different approaches for selecting study participants?	Leary (Ch. 5, pp. 99-112	Problem set 1 due
Feb 22	• What are the factors that we should consider in selecting participants for descriptive, correlational, and experimental research?	Leary (Ch. 5, pp. 112-114)	
Feb 23	• Practice selecting participants in Stata		
Week #6: How can we design instruments for a quantitative study? (part 1)			
Feb 27	• What are the different types of measures that we may collect in a study? • How do we operationalize these measures through scales?	Leary (Ch. 3, pp. 49-53)	Problem set 2 posted
Mar 1	• What are the different approaches for collecting quantitative data?	Leary (Ch. 4, pp. 71-95)	
Mar 2	• Practice developing items for a survey		
Week #7: How can we design instruments for a quantitative study? (part 2)			
Mar 6	• How do we make sure that our instrument measures what we want to measure?	Leary (Ch. 3, pp. 61-67)	Problem set 2 due
Mar 8	• What are the key ethical considerations we should keep in mind when administering instruments?	Leary (Ch. 15, pp. 312-324)	
Mar 9	• Practice critiquing items for a survey		
Mar 13-16	*[Spring recess – no class]*		
Week #8: How can we design randomized experiments? (part 1)			
Mar 20	• What are the different approaches for assigning participants to experimental groups?	Leary (Ch. 9, pp. 189-193)	Problem set 3 posted
Mar 22	• What problems should we anticipate when randomly assigning participants to experimental groups?	Leary (Ch. 9, pp. 194-206)	
Mar 23	• Practice randomly assigning participants to experimental groups in Stata		

Week #9: How can we design randomized experiments? (part 2)			
Mar 27	• How do we design an experiment to measure the causal effect of one variable?	Leary (Ch. 10, pp. 212-217)	Problem set 3 due
Mar 29	• How do we design an experiment to measure the causal effect of more than one variable?	Leary (Ch. 10, pp. 217-222)	
Mar 30	• Practice distinguishing between different experimental designs		

Part III: How can we analyze quantitative data?

Date	Topics	Readings	Assignments
Week #9: How can we analyze data from descriptive research?			
Apr 3	• How do we identify the typical value of a quantitative variable? (mean, median, and mode)	Leary (Ch. 6, pp. 124-131)	
Apr 5	• How do we describe the variation around the typical value of a quantitative variable? (variance, standard deviation, and the normal distribution)	Leary (Ch. 2, pp. 34-37; Ch. 6, pp. 131-137)	Problem set 4 posted
Apr 6	• Practice identifying the typical value and variation of quantitative variables in Stata		
Week #10: How can we analyze data from correlational research?			
Apr 10	• How do we describe the relationship between two or more variables? (correlation coefficient)	Leary (Ch. 7, pp. 142-148)	
Apr 12	• How do we determine whether the relationships we observe are due to chance? (reliability and statistical significance)	Leary (Ch. 3, pp. 53-61; Ch. 7, pp. 149-154)	Problem set 4 due; Problem set 5 posted
Apr 13	• Practice describing relationships between quantitative variables in Stata		
Week #10: How can we analyze data from experimental research? (part 1)			
Apr 17	• How do we compare the typical values from two or more groups of participants? (null and alternative hypotheses, effect sizes, and type I and type II errors)	Leary (Ch. 11, pp. 232-239)	
Apr 19	• How do we determine whether the differences we observe are due to chance? (t-tests)	Leary (Ch. 11, pp. 239-244)	Problem set 5 due
Apr 20	• Practice comparing the typical values from two groups using t-tests in Stata		
Week #11: How can we analyze data from experimental research? (part 2)			
Apr 24	• How can we minimize the possibility that the differences we observe are due to chance? (analysis of variance – ANOVA)	Leary (Ch. 12, pp. 250-257)	Problem set 6 posted

Apr 26	• How do we distinguish between the effect of a variable and the effect of interactions between two or more variables? (main effects, interactions, and multivariate analysis of variance – MANOVA)	Leary (Ch. 12, pp. 257-266)	
Apr 27	• Practice comparing the typical values from two groups using ANOVA in Stata		
Week #12: How can we use everything we learn to critique quantitative research?			
May 1	• What are the steps involved in critiquing quantitative research? • What are some common critiques of quantitative research?		Problem set 6 due
May 3	• Review for final take-home exam		Final take-home exam posted
May 4	• Practice critiquing quantitative research		
May 10	*[Exam period – no class]*		Final take-home exam due