APSY-UE 25

RESEARCH METHODS I*

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

Mondays and Wednesdays, 9:30-10:45am
7 East 12th Street, Fairchild Building, Room LL23

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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. He also thanks Andrew Ribner and Emilie Tumale, the assistants for the previous iteration of this course, for helpful feedback.

2. Pre-requisites

Students must complete APSY-UE 10 ("Developmental Psychology") before taking this course. Students may take PSYCH-UA 10 ("Statistics for Behavioral Sciences") or APSTA-UE 1085 ("Basic Statistics") either concurrently or after taking this course. 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:

- Weinberg, S. L. & Abramowitz, S. K. (2016). *Statistics using Stata: An integrative approach*. New York, NY: Cambridge University Press.

Students are expected to purchase/rent this textbook within the first two weeks of the academic year. It will introduce students to the statistical concepts and methods to be covered during lecture and to the statistical programming to be covered during recitation. Students are not expected to understand the readings before attending lecture or recitation, but they are expected to have completed them and made a good faith effort to understand them.

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. There is only one exception. In accordance to NYU's calendar policy on religious holidays, students who let the instructor (course assistant) know of their absences to lecture (recitation) due to religious holidays ahead of time will not incur any penalty on their attendance score. However, they are expected to review the slides, complete the assigned readings, and/or meet with the instructor and/or the course assistants to catch up with any missed lectures (recitations). No extensions will be granted due to religious holidays (see section on "Late assignments" below). There will be no exceptions.

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 41 sessions (including lectures and recitations), his/her score will be (40/41)*100 or 98. 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 and made a good faith effort to understand them. 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 not paying attention and/or participating 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 41 sessions (including lectures and recitations), his/her score will be (38/41)*100 or 93. 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 98 for his/her attendance and punctuality, a 93 for his/her class participation, a 92 for his/her problem sets, and a 70 for his/her take-home final, his/her overall course grade will be

(98*0.05)+(93*0.15)+(92*0.5)+(90*0.3) or 92. 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 November 5), and revised if needed when final grades are due (on December 21). 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".

Re-grades: After each problem set and the final take-home exam are graded, the instructor and course assistants will post a document to the course site with model answers and the scoring criteria for each question. Students are strongly encouraged to consult these documents to ask the teaching team any questions they might have on the material.

The instructor and course assistants will take turns grading each student's assignments, so that each student will be graded by a member of the teaching team at least twice if he/she turns in all problem sets. This process aims to avoid penalizing students for discrepancies in grading stringency across the members of the teaching team within the aforementioned guidelines.

Students may ask for their problem sets and/or take-home final exam to be regraded if, after carefully reviewing the model answers and scoring criteria, they do not believe that their grade is correct. Students who wish to request a regrade should e-mail the instructor no later than 48 hours after the model answers and scoring criteria have been posted. The instructor will conduct all regrades. He will regrade the entire problem set or exam, not just the questions that the student is disputing. Therefore, regrades may result in a lower, equal, or higher grade than the one originally awarded to the student.

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 are 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.

Late assignments: Students should budget enough time to submit their problem sets and exams well ahead of each deadline. Instructions for submitting each assignment will be announced during lecture. Late assignments, regardless of how late they are (even a minute past the deadline), will not be accepted. There will be no exceptions.

Surveys: The instructor will invite students to complete at least three surveys during the semester: a "student survey" (at the beginning of the semester), meant to allow the teaching team to get to know students better, and two "feedback surveys" (after the first and second parts of the course), meant to allow students to provide feedback to the teaching team on what is working well and what could be improved in the course. The teaching team takes feedback surveys very seriously and it will make a good faith effort to address the concerns raised by students.

All surveys are optional and there will be no repercussions for students who choose not to answer these surveys. The student survey will ask students for their identifying information (to avoid asking students questions for which the teaching team already has information and to link administrative and survey data), but the two feedback surveys will be anonymous. None of these surveys will be considered in students' course grades. All the information from these surveys will be deleted at the end of the course and it will not be used for any other purposes.

Audio/video recording: Audio and video recordings are not allowed during lecture or recitation. There are multiple reasons for this policy. First, the slides for each lecture are always written up in detail precisely so that students can catch up on missed lectures by reviewing the slides carefully. Second, the lectures and recitations are meant to explain the slides and readings, but they generally do not introduce new material. Third, students' performance on the course will not depend on whether they can remember details from lectures or recitations, but rather on whether they understand the concepts, procedures, and methods discussed in the course. This does not require a word-by-word recollection of the discussions in lectures or recitations. Fourth, students are strongly encouraged to attend office hours with the instructor and/or course assistants if they need to review any material covered in lectures or recitations. Exceptions will be granted only in response to requests for accommodations from the Moses Center for Students with Disabilities (see section on "Accommodations" below).

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 textbook and 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/).

7. i<Clickers

Each student is expected to purchase/rent and register an i<Clicker for this course within the first two weeks of the academic year. These i<Clickers will be used to take attendance and to check students' understanding of the material during lectures.

Students may register their i<Clickers by going to http://bit.ly/2DOlXyW, entering their information, and clicking on the "Register" button. They must use their NYU ID as their Student ID at the time of registration. They should enter the Course ID "APSY-UE 25" if requested at the time of registration. Finally, they should reach out to the course assistants if they need help registering their i<Clickers.

8. Writing

The problem sets and final take-home exam will involve a fair amount of writing (e.g., to define key concepts or explain results from statistical analyses). Students should not take this writing lightly; an important part of becoming a researcher is learning to convey arguments clearly.

Students are strongly encouraged to review their assignments for typos and grammatical errors before submitting them. They should also take full advantage of the various on-campus resources to help them improve their writing, including the Writing Center (https://bit.ly/2PMe13x), University Learning Center (https://bit.ly/2hBrgX0), and Academic Resource Center (https://bit.ly/2eR9xVw).

9. 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.

10. 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).

11. 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	Assignments
Week #1: Introduction to the course			
Sep 5	• What are the course objectives, components, grading, and classroom policies? • Who are the instructor and assistants?		Student survey posted

	• What resources are available to students?		
Sep 7	• Introduction to Stata		
Week #2: How do we ask questions in quantitative research?			
Sep 10	• What is descriptive research? • What is correlational research? • What is causal research?	Readings to be posted on course site	Student survey due
Sep 12	• What is a research question? • What is a theory? • What is a hypothesis?	Readings to be posted on course site	
Sep 14	• Practice formulating research questions • Practice formulating hypotheses		
Week #3: How do we operationalize questions in quantitative research? (part 1)			
Sep 17	• What are variables? • What are nominal, ordinal, interval, and ratio scales? What operations can we perform with each of these scales? • What are discrete and continuous variables? • What are string, numeric, and encoded variables in Stata?	Weinberg & Abramowitz (2016), pp. 1-11	Problem set 1 posted
Sep 19	• How do we describe the distribution of quantitative variables graphically? (bar graphs and histograms) • How do we categorize the shapes of these distributions? (symmetry and skewness)	Weinberg & Abramowitz (2016), pp. 26-42	
Sep 21	• Practice graphing variables in Stata		
Week #4: How do we operationalize questions in quantitative research? (part 2)			
Sep 24	• How do we identify the typical value of a quantitative variable? (mean, median, and mode)	Weinberg & Abramowitz (2016), pp. 72-84	Problem set 1 due
Sep 26	• How do we describe the variation around the typical value of a quantitative variable? • (range, inter-quartile range, variance, standard deviation, and the normal distribution)	Weinberg & Abramowitz (2016), pp. 84-92, 96-100	
Sep 28	• Practice describing the center and spread of distributions in Stata		
Week #5: How do we operationalize questions in quantitative research? (part 3)			
Oct 1	• How do we convey the relative standing of a value with respect to its distribution? (standard scores, z-scores, the Normal distribution, and the 68-95-99 rule)	Weinberg & Abramowitz (2016), pp. 121-129	Problem set 2 posted

	• How do we convey the distance between the typical value of two distributions? (using z-scores and percentile ranks)		
Oct 3	• How do we describe the relationship between two quantitative variables graphically? (scatterplots) • How do we categorize the shape, direction, and strength of these relationships?	Weinberg & Abramowitz (2016), pp. 153-159	Problem set 2 due Part I feedback survey posted
Oct 5	*[No recitation]*		

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

Date	Topics	Readings	Assignments
Week #6: How should we select participants in a quantitative study? (part 1)			
Oct 8	*[Fall recess – no class]*		
Oct 10	• What is the difference between a population, a sampling frame, and a sample? • What is the difference between a probability and a non-probability sample? • What are the most frequently-used types of probability samples in quantitative studies? (simple and stratified random samples)	Weinberg & Abramowitz (2016), pp. 259-265	Part I feedback survey due
Oct 12	• Practice drawing samples in Stata		
Week #7: How should we select participants in a quantitative study? (part 2)			
Oct 15	• Why do samples allow us to make inferences about populations? (central limit theorem) • How do we use samples to make inferences about populations? (interval estimation, hypothesis testing)	Weinberg & Abramowitz (2016), pp. 265-276, 281-296	Problem set 3 posted
Oct 17	• How does sample size affect our ability to make inferences about populations (statistical power and type I and II errors)	Weinberg & Abramowitz (2016), pp. 296-302	
Oct 19	• Practice power analyses in Stata		
Week #8: How should we collect data in a quantitative study?			
Oct 22	• What are the different types of measures that we may collect in a study? (observational, physiological, self-report, and archival methods) • How do we operationalize these measures?	Readings to be posted on course site	Problem set 3 due
Oct 24	• How do we make sure that our instruments measure what we want to measure? (validity)	Readings to be posted on course site	

	• How do we make sure that our data collection complies with guidelines for ethical research?		
Oct 26	• Practice developing survey items		
Week #9: How should we design randomized experiments?			
Oct 29	• Why does random assignment allow us to make causal claims? • What is the difference between a between-subjects and within-subjects randomization? • What are the most frequently-used types of randomizations in experiments? (simple and stratified random assignment)	Weinberg & Abramowitz (2016), pp. 374-380	Problem set 4 posted
Oct 31	• How do we design experiments to estimate the causal effect of one or more variables? (one-way and factorial designs)	Readings to be posted on course site	Part II feedback survey posted
Nov 2	• Practice random assignment in Stata		

Part III: How can we analyze quantitative data?

Date	Topics	Readings	Assignments
Week #10: How should we analyze data in correlational research?			
Nov 5	• How do we describe the relationship between two variables? (Pearson, Spearman, and Point Biserial correlation coefficients) • How should we interpret correlations between two variables? (causation, restriction of range, reliability)	Weinberg & Abramowitz (2016), pp. 159-174	Problem set 4 due
Nov 7	• How do we make sure that our instruments measure what we want to measure consistently? (reliability) • What are the most frequently-used approaches to measuring reliability? (test-retest, inter-item, and inter-rater reliability)	Readings to be posted on course site	Part II feedback survey due
Nov 9	• Practice estimating and interpreting correlations in Stata		
Week #11: How should we analyze data in experimental research? (part 1)			
Nov 12	• How do we use samples to make inferences about populations? (one-sample t-test) • How do we use samples to make inferences about differences between two groups in a population? (independent samples t-test)	Weinberg & Abramowitz (2016), pp. 308-342	Problem set 5 posted
Nov 14	• How do we use samples to make inferences about differences between more than two groups in a population? (one-way analysis of variance – ANOVA)	Weinberg & Abramowitz (2016), pp. 395-426	

Nov 16	• Practice running and interpreting t-tests in Stata		
Week #12: How should we analyze data in experimental research? (part 2)			
Nov 19	• How do we use samples to make inferences about differences between more than two groups in a population? (the Bonferroni adjustment)	Weinberg & Abramowitz (2016), pp. 426-429	Problem set 5 due
Nov 21-Nov 23	*[Thanksgiving recess – no class or recitation]*		
Week #13: How should we analyze data in experimental research? (part 3)			
Nov 26	• How do we use samples to make inferences about differences between more than two groups in a population? (two-way analysis of variance – ANOVA)	Weinberg & Abramowitz (2016), pp. 436-466	Problem set 6 posted
Nov 28	• How do we use samples to make inferences about differences between more than two groups in a population? (two-way analysis of variance – ANOVA, cont'd)		
Nov 30	• Practice running and interpreting ANOVAs in Stata		
Week #14: How should we critique quantitative research?			
Dec 3	• What design aspects should we consider when critiquing quantitative research? (sampling, randomization, measurement)	Readings to be posted on course site	Problem set 6 due
Dec 5	• What analysis aspects should we consider when critiquing quantitative research? (empirical strategy, multiple comparisons, interpretation of results)	Readings to be posted on course site	
Dec 7	• Introduction to SPSS		
Week #15: Review for the take-home final			
Dec 10	• Review for take-home final (part 1)		
Dec 12	• Review for take-home final (part 2)		
Dec 14	*[No recitation]*		
Dec 17-Dec 21	*[Exam period – no class or recitation]*		Final take-home exam posted/due