

**Quantitative Research Design and Analysis**  
**ELP 391P**  
Spring 2019

Semester: Spring 2019  
Meeting times: Tuesday 1-4pm  
Meeting room: SZB 376  
Instructor: Lauren Schudde  
    Email: [schudde@austin.utexas.edu](mailto:schudde@austin.utexas.edu)  
    Office: SZB 310A  
    Office hours: Tuesdays 4-5  
Teaching Assistants: Ibrahim Bicak  
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    Office hours: 11-1 Mondays, SZB 536 study area

**Course description:**

This course is designed to give you an introduction to the workings of research and quantitative methods necessary to support research. The emphasis is on *introduction*, as many students enter this course with limited experience in quantitative research. Students enrolled in this course should already have acquired basic knowledge in mathematical concepts such as algebra and descriptive statistical methods.

The main objective of this course is to *apply* the concepts and methods of quantitative social science research on education policy issues. A second objective is to help students become knowledgeable, critical *consumers* of quantitative education research. The course is an introduction to several (yet not exhaustive) core techniques, applications, and concepts useful for framing and evaluating quantitative inquiry.

The course treats statistics as tools researchers use to gain insight into education policy issues through a process that involves the thoughtful and reflective application of logic, theory, prior research, and evidence in our pursuit of new knowledge. You will learn how to:

1. Use quantitative data to understand and address policy problems in education
2. Understand how statistical analysis fits into a larger inquiry process
3. Perform basic statistical analyses and data displays using statistical software
4. Use statistics to communicate key findings and evidence
5. Use statistics to examine differences between and among groups
6. Use statistics to examine relationships between variables

Students will develop these skills through reading assignments, lectures, class discussions, in-class activities, and assigned projects. We will use Excel to do some “by hand” calculations as we learn formulas for certain statistics. Once we have a sense of how these statistics are calculated, we will use **Stata** as a software tool for practicing these methods on largescale data. This software program is one that I expect should meet any future research needs you will face, if continuing to use quantitative methods. It has the option of both drop-down menus and syntax

(programming code to run analyses) and has very responsive support staff (housed in College Station, TX), a user web forum, and its own peer-reviewed journal to help users.

Computer proficiency is necessary to become competent in quantitative methods. I expect you to bring a laptop with access to Microsoft Excel (or Google sheets) and that can access Stata from the Statistics department's Stat apps server (visit <https://stat.utexas.edu/consulting/stat-apps-server> and follow instructions to connect). Outside of class, if you are in SZB, you can also access Stata in the 4<sup>th</sup> floor computer lab (SZB 439). You may purchase a license for Stata for your personal computer, though it is pricey, so I encourage you to become familiar with the program first.

### **Required Text:**

1. Dietz, T., & Kalof, L. (2009). *Introduction to social statistics: The logic of statistical reasoning*. John Wiley & Sons.
  - a. I recommend purchasing through Amazon, which is significantly cheaper than the Co-op.
  - b. A copy will also be placed on reserve at PCL.
2. All supplementary material will be available on Canvas as file downloads or e-books through the library. Find links to supplemental readings under the "Modules" tab of our course Canvas page

### **Other Required Materials:**

1. Laptop with Microsoft excel to help with by-hand calculations and internet access to use the Stat apps server

### **Course Assignments:**

#### **1. Reading Responses (10%)**

To give me a sense of how you are doing with the reading (and to give you a sense of which concepts are most important), some weeks will require you to answer questions related to the readings before class. The questions will be posted to canvas the week prior and must be answered on canvas by 9am the day of class when the reading is due. The lowest grade will be dropped.

#### **2. Exercises (50%)**

To assess and provide feedback on your learning, a series of 5 exercises (worth 10 points each) will be assigned throughout the term and are due at the start of class (1pm) on the due date. These are designed to help students become effective consumers and producers of statistical information.

- EX1: *Explain the logic of statistical models and the concept of error* (due **2/12**)
- EX2: *Calculating variance and standard deviation, discussing causality* (due **2/26**)
- EX3: *Testing a hypothesis and calculating confidence intervals* (due **3/12**)
- EX4: *Critiquing a published research article* (due **4/9**)
- EX5: *Creating a regression line by hand and in Stata* (due **4/23**)

#### **3. Final exam (35%)**

The final exam will be a culmination of the work conducted throughout the semester. Students will have at least one week to complete this final exam, which is due **May 10<sup>th</sup>** by 5pm. Full details will be provided in class

#### **4. Active participation (5%)**

To receive full participation points, you should actively participate in class—this requires attendance, preparation (through readings and topical assignments), and willingness to contribute to discussions in a variety of group configurations (pairs, small groups, entire class, etc.). Come prepared to share the most interesting piece of new knowledge you gained from the week's reading material. Alternatively, students can offer a point of confusion from reading through the material.

Additionally, each student is required to attend Dr. Schudde's office hours *at least once* during the semester. If you have a tight schedule, sign up in advance here:

<https://calendly.com/schudde/30min>

### **Philosophy for Teaching Statistics:**

I know that many students come to this class with concerns over statistics—many students worry that they know little about the topic. I want to emphasize that even advanced applied researchers who use quantitative methods must continually learn, update their skillset, and ask questions. Few applied researchers come to a new method perfectly able to interpret the results—it takes hard work and persistence. That said, what I expect in this class is open-mindedness and a willingness to put in the work to learn new tasks. That means spending time on the reading (take notes, read for understanding rather than a quick skim), visiting office hours ask questions and get help with new concepts, practicing calculations by hand and making corrections when necessary, and using practice data sets to ensure you understand the programs reviewed in class.

I also expect that this work will be collaborative—please work with your peers and develop study groups to go over homework and in-class exercises. Most research is collaborative, even when it is sole-authored. It is very rare that I have submitted a paper for review without asking for feedback. Now is the time to build a network of peers you trust to help with comprehension and to improve the quality of your work. The only exception where I do not want you to work with peers is the final exam.

### **Grading:**

To encourage learning through correcting mistakes, I provide second chances to get the right answers on homework assignments, so long as it is clear that students are taking the time and putting in the effort to improve their learning. When assignments are returned to you, you will have *one week* after the grade is returned in which you can meet resubmit for re-grading. The TA and I are available to follow-up with any questions/concerns you may have regarding each assignment.

I do not offer extensions unless they are for unavoidable extenuating circumstances (please notify me as soon as possible). Competing assignments/deadlines in other classes *are foreseeable* and, therefore, not an adequate excuse for an extension; please plan in advance and make sure you can complete assignments on time. Late assignments will be docked 1 point (out of 10 for homework and out of 35 for the final exam) after the deadline has passed, with an additional point docked for each day past the deadline.

The following grading chart is used for final grades in this class. I assign point values for each assignment (e.g., 10 points for each homework assignment), where each assignment contributes its weight of the 100 points in the class.

<u>Percentage</u>	<u>Grade</u>	<u>Percentage</u>	<u>Grade</u>	<u>Percentage</u>	<u>Grade</u>
94-100	A	87-89	B+	70-79	C
90-93	A-	84-86	B	60-69	D
		80-83	B-	0-59	F

### **Additional Course Policies:**

*Attendance:* Because of the hands-on nature of this course, students are expected to attend all course meetings. It is understood that professional responsibilities and medical emergencies may require students to miss one or two classes in the semester. If you anticipate missing more than two class meetings, you should seriously consider taking ELP 391P at a time when you can commit to the class meeting schedule. If you miss more than two classes, you will lose participation points (.25 per class). In instances of illness or emergency, students should arrange to borrow lecture notes or materials from a classmate. (It is your responsibility to “catch up.”) Please make every effort to be in class on time. The interactive nature of the course means that arriving late will be disruptive to other participants. Please be mindful and observe etiquette (it’s never appropriate to answer a call during class; in case of an emergency you should leave the room and answer).

*Computer use:* Computer use is permissible in this course if being used for note-taking and supplemental purposes. Excessive misuse of technology (checking e-mail/Facebook during class, etc.) may result in a deduction of class participation points. If it becomes a problem, I reserve the right to change our technology policy (i.e. disallow computer-use during class). **Please do not use cell phones during class and silence phones before the start of class.**

*Incomplete Policy:* I will not grant incompletes as a matter of course; they will be discussed only in extenuating circumstances. If you anticipate difficulty in completing the course requirements in time, you should reconsider taking this course.

*Guidelines for Submitting Assignments:* All course assignments will be submitted electronically in Canvas. No paper submissions will be accepted. Homework exercise are due by the specified due date at the start of class on Canvas (it automatically highlights late submissions). A word of advice – do not wait until just before class to submit your assignment and please make sure you save back-up copies! Reading responses are due by 9am on the day of class, when applicable. Late assignments will receive a point deduction when overdue (i.e., you will lose one point up to a day after, and an additional point for each additional day).

*Communication:* Course updates and information will be distributed via e-mail. You will need to regularly check the Canvas site, particularly the day of class. Be sure that your e-mail address is up-to-date and one you use on a regular basis.

### **University Policies**

*Students with Disabilities:* The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471.4641 TTY. For additional information, please refer to the Services for Students with Disabilities Web site at:

<http://diversity.utexas.edu/disability/>

*Scholastic Dishonesty:* Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University. Policies on scholastic dishonesty will be strictly enforced. When in doubt,

always err on the side of caution – consult the instructor if you have a question about an issue. For further information, please visit the Student Conduct and Academic Integrity Web site at: <http://deanofstudents.utexas.edu/conduct/>

*Sexual Discrimination and Sexual Harassment:* Students who believe they have experienced sexual harassment in the academic environment should consult the following Web site:

<https://policies.utexas.edu/policies/prohibition-sex-discrimination-sexual-harassment-sexual-assault-sexual-misconduct> Students are also encouraged to call the Office of the Dean of Students at 471-5017 and ask to speak to the Associate Dean of Students.

*University Electronic Mail Student Notification Policy:* Official communication with students in this class will be conducted through e-mail. Course announcements and updates will be posted on the Canvas site. Students are expected to check e-mail on a frequent and regular basis in order to stay current on class activities and assignments. Unless otherwise notified, the instructor will use the e-mail provided to the University as the official address. For more information read:

<https://cio.utexas.edu/policies/university-electronic-mail-student-notification-policy>

*Course Evaluation:* You will be asked to provide the professor with informal feedback regarding aspects of the course that should be changed for future semesters. At the conclusion of the class, you will have the opportunity to evaluate the course and the instructor.

*NOTE: This syllabus is adapted from the work of Nick Hillman at UW-Madison, who was generous in sharing materials and insights from years of teaching introductory quantitative methods.*

*This is a living and breathing document—I reserve the right to update throughout the course of the semester and will update you of any changes.*

Week	Date	Topic	Readings	Reflections	Due
1	1/22	Welcome and Overview		How comfortable are you with statistics? What are your goals for the course?	
2	1/29	Goals of quantitative research & statistical models	D&K Preface, ch. 1 Skim: Gillborn et al.	What research questions are well suited for quantitative methods? What is a “statistical model” and why is “error” important?	Reading Q’s
3	2/5	Basic Concepts	D&K Ch. 2 Skim: D&K Ch. 3	Why is it important that we know the level of measurement for a given variable? Why do we need to know the unit of analysis?	Reading Q’s
4	2/12	Descriptive Statistics and Dispersion	D&K ch 4 (skim 133-135 on boxplots) & 5 Loeb et al. p. 18-27 (skim the rest)	What are the benefits of measures of central tendency and how can they help address policy questions? Conceptually, what does the standard deviation mean?	EX1
5	2/19	Causation and Research Design	D&K Ch. 6 Skim: Schneider et al. Ch. 1 & 5	What is the rationale behind social experiments? What challenges might exist when assigning students to a treatment?	Reading Q’s
6	2/26	Probability and Sampling Distributions	D&K Ch. 7 & 8 Optional: Meier Ch. 8	What is the law of large numbers? What sampling problems might arise when conducting education research?	EX2
7	3/5	Confidence Intervals & Hypothesis Testing	D&K Ch. 9 & 10 Skim: Seftor	Under what conditions might Type I error (false alarm) be better or worse than Type II error (missed detection)?	Reading Q’s
8	3/12	ANOVA, Chi-Square, and Intro to Stata	D&K Ch. 11 & 12	How can ANOVA and Chi Square help policymakers and school leaders address concerns about educational equity?	EX3
9	3/19	No class—Spring break			
10	3/26	Descriptive Statistics in Stata	Longest Ch. 1-5	Data management is among the most important quantitative research skills. Why? What other skills are important to develop?	Reading Q’s
11	4/2	Correlation and Regression in Stata	D&K Ch. 13; Allison Ch. 1 & 2	What are possible relationships could you explore with quant. methods in your own research? What data and variables would you need to test these?	Reading Q’s
12	4/9	No class—AERA		(Work on your article review—do a close reading of Cortes & Lincove piece)	
13	4/16	Interpreting Regression Results	Cortes & Lincove	Researchers use different regression techniques (not always OLS). When do they use different approaches and	EX4

				how do they display results differently. Why are these different?	
14	4/23	Regression in Stata	Longest Ch. 6, 7, 8	How does statistical software change our ability to calculate and present results from largescale data? Why do we use dofiles?	Reading Q's
15	4/30	Multivariate Regression	D&K Ch. 14 Sablan	What are the implications of cleaning data for your results? When would regression be relevant for your research? Are quantitative methods and critical theory compatible?	EX5
16	5/7	Final Exam Workshop	Optional: Angrist, Schudde	*Sign up for one-on-one meeting with Dr. Schudde about final exam; come with questions (20 minutes allocated to each student)	FE due 5/10

## Citations for Course Material

- Allison, P. (1999). *Multiple Regression: A Primer*. Thousand Oaks, CA: Pine Forge Press. Ch. 1, Ch. 2
- Angrist, J. (2004). American education research changes tack. *Oxford Review of Economic Policy*, 20(2), 198-212.
- Cortes, K. E., & Lincove, J. A. (2018). Match or Mismatch? Automatic Admissions and College Preferences of Low- and High-Income Students. *Educational Evaluation and Policy Analysis*. <https://doi.org/10.3102/0162373718813360>
- Dietz, T., & Kalof, L. (2009). *Introduction to social statistics: The logic of statistical reasoning*. John Wiley & Sons.
- Gillborn, D., Warmington, P., & Demack, S. (2018). QuantCrit: education, policy, 'Big Data' and principles for a critical race theory of statistics. *Race Ethnicity and Education*, 21(2), 158-179.
- Loeb, S.; Dynarski, S.; McFarland, D.; Morris, P.; Reardon, S.; & Reber, S. (2017). *Descriptive analysis in education: A guide for researchers*. U.S. Department of Education: Washington, DC.
- Longest, K. (2015) *Using Stata for Quantitative Analysis* (2nd Edition). Thousand Oaks: Sage.
- Meier, K., Brudney, J., & Bohte, J. (2012). The normal probability distribution. *Applied Statistics for Public and Nonprofit Administration* (8th Ed.).
- Sablan, J. (2018). Can you really measure that? Combining Critical Race Theory and quantitative methods. *American Educational Research Journal*.
- Schneider, B.; Carnoy, M.; Kilpatrick, J.; Schmidt, W.; Shavelson, R. (2007). *Estimating causal effects using experimental and observational designs*. American Educational Research Association, Washington, D.C.
- Schudde, L. (2018). Heterogeneous effects in education: The promise and challenge of incorporating intersectionality into quantitative methodological approaches. *Review of Research in Education*, 42(1), 72-92.
- Seftor, N. (2017). *What does it mean when a study finds no effect?* U.S. Department of Education: Washington, DC.