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**Global 12 – How to think like a quantitative social scientist**

Fall 2023, MWF: 4-4:50 pm. 1440 Phelps Hall

Prof. Mehta's Office Hours: MWF 4:50-5:20 pm, Phelps Courtyard or 2111 SSMS.

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Course Description: Students are more successful in quantitative social science (QSS) and related statistics courses when they have had prior exposure to the types of reasoning, language and procedures used in these fields. This is because to understand *how* social scientists do the things we do with numbers (the subject of those courses) you must first understand *why* we do them. Success in QSS also relies on confidence and comfort with mental arithmetic and common ways of displaying and discussing quantitative data. These conceptual and mathematical foundations are particularly important for students attempting social-science majors at UCSB that can only be declared after earning high grades in pre-major courses<sup>1</sup>. Many good students do not make it through their pre-majors, and you are at risk of becoming one of them if your high school did not provide as much prior exposure or comfort with the (social) scientific approach and formal reasoning. So also, if you are uncomfortable with interpreting graphs, quickly processing simple numerical arguments, setting up word problems, and performing basic mental arithmetic. Global 12 will help you to make up some of these lacuna in a cooperative, learning-intensive setting.

Course Objectives: (1) Familiarity with core principles of social science reasoning and research;<sup>2</sup> (2) Exposure to quantitative/ deductive social science theories and research papers, to make these core principles intuitive; (3) Improved ability to draw appropriate social-scientific inferences from statistical tables and graphs; (4) Experience with calculation and analysis of quantitative data in spreadsheets; (5) Mastery of the specific mathematical skills you will need to succeed in lower-division courses in QSS; and (6) Confidence working with such material in classroom and group settings.

What we will work on: Instructors in “weeder” courses list these determinants of student success:

- Good study habits/skills, emphasizing individual practice, as well as group work and discussion.
- Familiarity with propositional and causal logic.
- Familiarity with the key terms used to state and qualify causal social-science theories.
- Exposure to why it is difficult to test causal social-science theories.
- Exposure to some key elements of social science research design.
- Confidence speaking about each of the above, and explaining them to your classmates.
- Confidence applying the mathematical procedures invoked in those barrier courses.
- A little experience playing with numerical data.
- The ability to calmly identify what you have and have not understood about a formal argument, and to confidently ask for help on the latter.

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<sup>1</sup> Pre-major requirement sheets for the QSS majors are posted on the course Gauchospace page.

<sup>2</sup> There are many approaches to social science. We will focus on deductive approaches (stating theories clearly and using data to test the implications of those theories), over inductive methods (gathering data and seeing what theories those data suggest).

### Activities:

We will proceed along two tracks – social science reasoning and mathematical foundations. These tracks will increasingly intersect as the term goes on.

You will build your **social-science reasoning** skills through two activities. Together they will help you to develop a sense of when and how one can interpret patterns in numerical data in ways that credibly answer different types of theoretical questions. This is the essence of all QSS, regardless of disciplines.

- **Interactive lectures**, taking 25-35 minutes of class time based on some short readings. These will cover the core concepts through which quantitative social scientists think, and some specific examples and methods to illustrate their usefulness. They will also introduce you to how to read social science papers.
- **Eight homework assignments**, due mainly on Fridays, starting in week 2, covering concepts introduced in these interactive lectures. I will help you to form groups of 2-4 students. You will turn in one homework per group. [Group discussions **MUST** be held in English.]

You will build your **mathematical/logical foundations** through three activities. No calculators allowed.

- A 5-8 minute **quiz** that drills a growing set of mathematical skills commonly required in QSS. Quizzes will be given during the first 8 minutes of each class meeting, and will only be available to students who are physically present in class at this time. These will commence on Monday October 9.
- Occasional 7-10 minute **in-class mathematical activities** introducing a new skill, that will begin appearing on the daily quizzes two course meetings later (e.g. if we introduce it on Monday, it can appear on quizzes starting on Friday).
- **Worksheets** to drill the new skill before it appears on the quiz. I **STRONGLY** advise you to complete all the worksheets and come to OH for help whenever you are less than 100% confident after doing so, in order to ace your quizzes.

While many of the above math skills may appear familiar or even easy, most Freshman cannot apply them to social science (i.e. word problems), apply them quickly, or make the calculations involved in their heads. To keep up in QSS lectures and to succeed in your pre-major you will have to do all three.

Grading scheme: Quizzes 24%, Homework assignments: 32%, Course Participation: 20%, Verbal assessment 20%. A further 4% of your course grade will be based on taking two online assessments, one at the start of term, and one at the end. You will get the full points if I decide you have taken it seriously – which I will, so long as you apply yourself to each question. Homework scores are based on performance. Quiz scores are also based on performance, after dropping each students' three lowest quiz scores. Participation scores are based on engagement and effort, and will never be revealed to you. The scores will not follow the high-school practice of >90 ≈ A; 80-90 ≈ B; etc. The class is not graded on a curve, and is designed so that everybody who puts in maximal effort is capable of achieving an A. Those who do not put in maximal effort will receive lower grades.

Materials: Buy the course reader from the Associated Students' Copy Shop prior to the first course meeting. It contains all of the readings and lecture slides for the quarter. Bring it with you to every class. Also, bring pencils and an eraser to each class to use during your quiz, and multiple colors of pens/pencils for taking notes on your reader.

Office Hours: Arthur Fang is the course tutor. Please see him or me regularly during office hours.

Advice for success: In this course and throughout your college career:

- Study regularly for this class in small doses (e.g. one hour per day).
- Do all of your math worksheets, check your answers, and bring your doubts to office hours. If you have no doubts, come to office hours and/or join your study group to confirm your understanding and to practice talking about QSS.
- Do the assigned readings and thought exercises before class.
- Bring your homework solutions to OH and get them checked before you turn them in.
- Do not be afraid to ask questions or be embarrassed by the things you think you do not know. You are not alone, and your questions will benefit other students in the class.
- Expect to spend 6 hours per week outside class studying for this course on average. Count up the expected study hours across all your classes, add 30% to the total, and make sure your work and extra-curricular activity schedule allows you at least that much study time. If not, you are not being realistic about the amount of study time you will need to complete a QSS major.

Further math preparation for QS majors/courses

The following describes the main mathematical concepts/skills (column 3) that you will need in barrier courses (column 2) in your prospective QSS major (column 1). Instructors will usually assume that you have learned them in high-school, although in reality, many of you have not. **Global 12 covers most of these skills, but will not cover everything you need prior to Math 2A/B, Math 34A/B and Econ 10A, which are algebra and calculus intensive.** I recommend that you take the time to master each of the Khan Academy courses listed in columns (4) and (5) on as well.

(1)	(2)	(3)	(4)	(5)
<b>Major</b>	<b>Barrier Courses requiring math skills / formal logic</b>	<b>Core Math Tools/ Concepts Required to succeed in these classes.</b>	<b>Khan Academy courses to master before entering challenging classes.</b>	<b>Additional Khan Academy courses that will help you (in order of importance) ...</b>
Economics/ Accounting	Econ 1; Econ 2, Economics 5 or Math 2A/B or Math 34 A/B; Econ 10A	Setting up word problems, linear equations, quadratic equations, arithmetic in your head, derivatives, partial derivatives, logarithms & exponents, solving simultaneous equations.	Algebra 1, Geometry, Algebra 2, Trigonometry (for math, not econ), Precalculus.	AP calculus BC, High school statistics, Probability and Statistics
Political Science	Polisci 15	Setting up word problems, linear equations, arithmetic in your head, derivatives, arithmetic in your head. Derivatives and partial derivatives helpful.	Algebra 1, Geometry, Algebra 2, High school statistics, Precalculus,	Probability and Statistics, AP calculus BC
Sociology	CMPSOC 5A, PSTAT 5A-ZZ, Comm 87	Linear equations, setting up word problems, arithmetic in your head, mean, median, variance and Std. Dev.	Algebra 1, Geometry, High school statistics	Probability and Statistics
Communications	Comm 87, 88	Straight line equations, setting up word problems, arithmetic in your head, mean, median, variance and Std. Dev.	Algebra 1, Geometry, High school statistics	Probability and Statistics

Session	Date	Day	Social Science idea discussed	Reading	Homework Due	
1	29-Sep	Friday	Introduction			
<b>Motivation: Why Quantitative Social Science?</b>						
2	2-Oct	Monday	Motivation: QSS as BS detection.	Frankfurt (2005).		
3	4-Oct	Wednesday	Motivation: QSS as detective work.	Kreuger (1999). Abstract, introduction, conclusions.		
4	6-Oct	Friday	Motivation: QSS to inform policy and public deliberation	Bleemer, Davidson & Mehta (2023).		
<b>Core Concepts: Types of Questions, Causal Theory, and Operationalization</b>						
5	9-Oct	Monday	Necessary and Sufficient; Positive vs. normative questions	Definitions of Positive and Normative Economics		
6	11-Oct	Wednesday	Independent and dependent variables. Causal descriptions	K&W, Ch. 2 Appendix		
7	13-Oct	Friday	Interpreting scatter plots		HW#1: Calculating slopes. Critical reflections on BS.	
8	16-Oct	Monday	Causation vs. Correlation	"Explaining the gender wage gap" (Center for American Progress), Shadish Cook & Campbell - Defining Causation		
9	18-Oct	Wednesday	Causal Description vs. Causal Explanation/Theory	Van Evera, pp. 7-27		
10	20-Oct	Friday	Operationalized causal theory	Van Evera, pp. 7-27	HW#2: Making and interpreting scatter plots.	
<b>Quantitative Data - The Basics</b>						
11	23-Oct	Monday	Types of variables			
12	25-Oct	Wednesday	Underrepresentation	Hasan & Mehta (2006)		
13	27-Oct	Friday	Types of graphs for types of variables		HW#3: Mapping and operationalizing a causal theory.	
14	30-Oct	Monday	Types of positive questions and the types of exhibits that answer them	Bleemer & Mehta (2022 - on Canvas).		
15	1-Nov	Wednesday	Getting our hands dirty with some data (class meets in computer lab, 1005 SSMS)	"Explaining the gender wage gap" (Center for American Progress); HW# 5 Instructions		
16	3-Nov	Friday			HW#4: Connecting types of questions, variables and graphs.	
<b>Research Design</b>						
17	6-Nov	Monday	Showing causation through experiments. Application - testing for overt racism.	Bertrand and Mullainathan (2004). "Are Emily and Greg More Employable than Lakisha and Jamal?"		
18	8-Nov	Wednesday				
	10-Nov	Friday	<u>No Class - Veteran's Day</u>			
19	13-Nov	Monday	Showing causation through natural experiments	Carpenter & Dobkin (2009). "The effect of alcohol consumption on mortality".	HW#5: Understanding gender wage gaps	
20	15-Nov	Wednesday				

Session	Date	Day	Social Science idea discussed	Reading	Homework Due
21	17-Nov	Friday	Wealth and health (1)	Pritchett & Summers (1996). "Wealthier is healthier"	HW#6: Explaining an experiment
22	20-Nov	Monday	Wealth and health (2)		
23	22-Nov	Wednesday	Wealth and Health (3)		
24	24-Nov	Friday	<u>No Class - Thanksgiving</u>		
	27-Nov	Monday	Wealth and Health (4)	Pritchett & Summers (1996). "Wealthier is healthier"	
<b>Critical Thinking through Quantitative Social Science</b>					
25	29-Nov	Wednesday	Slack Day (Bring questions)		
26	1-Dec	Friday	What is a good causal theory (prep)?	Harvey (2005) "A brief history of neoliberalism", pp. 1-63.	HW#7: Explaining a natural experiment
27	4-Dec	Monday	What is a good causal theory?	Van Evera	
28	6-Dec	Wednesday	Fallacies day	Nowrasteh (2018), Messerli (2012)	
29	8-Dec	Friday	Conclusions		HW#8: Explaining an observational study