Workshop for teachers of quantitative methods for political science students

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What we’ll talk about today

1. Some preliminaries

2. The goals of a quantitative methods class

3. A proposed outline for a course in quantitative methodology
   - Thinking skills for assessing causal relationships
   - Statistical skills for assessing causal relationships

4. How to encourage our students to produce their own research

5. Final remarks
Preliminary questions

- Should we require quantitative methods classes for Political Science majors?
- But if departments require these classes, won’t they hate the instructor?
- When should they be taught – i.e., for entering students, for those near the end of their degree programs, etc.?
A caveat
What do we want students to be able to do after successfully completing a course in quantitative methodology?

- To be critical consumers of information in the media.
- To be competent consumers of actual political science research.
- To perform basic statistical analyses using software packages.
We have to show students what researchers do

All scientists—including Political Scientists—are involved in two basic activities:

1. We generate new causal theories.
2. We test these new causal theories against evidence from the real world.

The key take-home point
We need to teach students both the thinking skills and then the associated statistical techniques involved in assessing causal relationships.
Where do theories come from?

- A recipe?
- An emphasis on the **new**.
- New theories can come from:
  1. A focus on dependent variables
  2. Moving from specific events to more generalizable phenomena
  3. Learning what the literature may have missed
  4. Formal theory
Thinking about causal relationships

Once we have a causal theory, how do we know whether the independent variable \(X\) causes the dependent variable \(Y\)?

**Four causal hurdles**

1. Is there a credible causal mechanism that connects \(X\) to \(Y\)?
2. Can we rule out the possibility that \(Y\) could cause \(X\)?
3. Is there covariation between \(X\) and \(Y\)?
4. Have we controlled for all confounding variables \((Z)\) that might make the association between \(X\) and \(Y\) spurious?
Research designs for assessing causal relationships

Given that our theories are (normally) bivariate, but we live in a multivariate world, how can we control for other possible causes of the dependent variable?

- Experiments
- Observational studies—cross-sectional and time-serial
The importance of measurement

Key idea

Many critical concepts in political science—like democracy or prejudice—are not easy to measure empirically. So how we go about it matters.
The basics: Variance and covariance

- Central tendency
- Variance: The foundation for co-variance
The logic of hypothesis testing

- The relationship between observations from a sample and the population about which we care
- Can undergraduates handle Bayesian thinking?
- The importance of teaching the Central Limit Theorem
Bivariate hypothesis testing (as a warm-up)

Which bivariate test to use depends on the variable types of independent and dependent variables

**Table:** Variable types and appropriate bivariate hypothesis tests

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<td>Continuous</td>
<td>Difference of means</td>
<td>Correlation coefficient; bivariate regression</td>
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Bivariate regression

The emphasis

Teaching bivariate regression enables us to familiarize our students with the way that “rise over run” logic from algebra is relevant for social relationships.

- How much about OLS can/should we teach undergraduates?
Multiple regression as the key to assessing causal relationships in a multivariate world

- How does multiple regression pertain to the Four Causal Hurdles, especially the last?
- What happens in regression models when we fail to control for other possible causes of the dependent variable?
If a student wants to produce his or her own research what do they need to be able to do?

- To identify a **new** research question, likely through one of three techniques:
  1. A new $Y$ (and some $X$)
  2. An existing $Y$ and a new $X$
  3. An existing $X−Y$ relationship in a new context

- To capably evaluate both individual studies and the literature as a whole, with an emphasis on **what we don’t yet know**

- To understand the strengths and weaknesses of various research designs

- To competently analyze data and draw appropriate conclusions

- To clearly present tables and figures, and to connect text to those tables and figures
Is this realistic?

Yes