**Questions to answer in preparing for Class 1**

# Chapters 1-3 of *Methods Matter* and Hoxby (2016)

* 1. Describe three critical conditions that must be met in order to claim that one thing *causes* another.
  2. How would you define an experiment? What is the difference between a randomized experiment and a quasi-experiment?
  3. What is the meaning of the term “exogenous”? Contrast it with the meaning of the term, “endogenous.” How are the terms relevant to attempts to make causal inferences about the consequences of an educational policy or intervention?
  4. Why was it not possible for James Coleman and his colleagues to provide defensible estimates of the impact of school resources such as class size on student achievement?
  5. Hoxby argues that attempts to use regression analysis to distinguish the relative influence of, for example, family and school effects are misguided. Why? (self-check: are you able to use the term *omitted variable bias* as part of your answer?)
  6. Until fairly recently, what were the two strategies social scientists used in attempting to make causal inferences from observational data? What are the problems with these strategies?
  7. Why is it more difficult to conduct compelling causal research in education than in, say, agriculture?
  8. What does the term, “counterfactual,” mean? How is it relevant to causal research?
  9. What is the difference between the concepts: internal validity and external validity? Provide an example of each, using a study of whether average student achievement is higher in classes serving relatively few students than in classes serving larger numbers of students.
  10. Consider an evaluation of the effectiveness of Success for All (a K-grade 6 school-wide approach to teaching reading and other English Language Arts skills). (You can find a description of the elements of the SfA approach by typing “Success for All” on a search engine site.)
      1. What would be plausible mechanisms through which introduction of the school-wide SfA program would result in improved English Language Arts skills for students?
      2. What conceptual experiment would you like to conduct to evaluate the contributions of SfA? What questions would your conceptual experiment answer? What would the “control group experience” consist of? What data would you want to collect as part of the experiment? In preparing the answer to this question, be sure that you can use the following terms: exogeneity; endogeneity; internal validity; external validity; threats to validity.
  11. Explain the meaning of the term, theory, as it applies to social science research, including research on education.

# Chapters 4 and 5 of *Methods Matter*

* 1. The role of covariates in analyzing data from random assignment experimental studies.
     1. Are there any reasons not to add legitimate covariates to the regression models used to estimate treatment effects? Explain!
     2. Provide examples of legitimate covariates in the NY Scholarship experiment and examples of covariates that would not be legitimate to include in models estimating the experimental effects in this study.
  2. Critical Decisions in Designing an Experimental Study
     1. Using the example of the MDRC career academy study, list some critical decisions involved in the design of an experimental study, and the tradeoffs involved in particular decisions.
     2. What is the difference between *intent-to-treat* (ITT) and *treatment-on-the-treated* (ToT) estimates? Explain using examples from the career academy study and the New York Scholarship study.
  3. Gaining support for experimental studies
     1. Using the example of the Duflo study of incentives for teachers in India, describe some strategies researchers have used successfully to gain support for randomized studies.
     2. In what respects are the challenges of gaining support for randomized experiments different in countries like the U.S. than they are in a developing country like India? In what ways are the challenges similar

# Chapter 7 of *Methods Matter*

* 1. Random effects
     1. Using the example of Geoffrey Borman and colleagues’ evaluation of SfA, explain how a random intercepts multi-level model can be used to account for the unobserved common experiences students have within schools. Be sure you are prepared to discuss the details of Equation 7.1, including the error (stochastic) terms.
     2. In what ways is the intraclass correlation statistic informative about “within” and “between” school variation? How does the proportion of variation at the individual level inform the analyst’s anticipated ability to identify programmatic effects?
     3. The random intercepts model makes a key assumption (like all regression specifications) about the correlation between predictors and individual/group error terms in the model. What is that assumption?
  2. Fixed effects
     1. Explain how a fixed effects multi-level model can be used to account for the unobserved common experiences students have within schools. Be sure you are prepared to discuss the details of Equations 7.6 and 7.7.
     2. Why is not possible to use unit fixed effects that occur at the same level at which treatment is assigned?
     3. Why is it not possible to simultaneously include school- and district-level fixed effects in a single specification?
     4. At what level has the residual term been estimated in Equations 7.6 and 7.7? Does this seem right to you? What assumptions have been made about how error terms are correlated as specified in these models?
  3. Random vs. fixed effects
     1. What are situations in which the random intercepts model is superior to the fixed effects model?
     2. What are situations in which the fixed effects model is superior?
     3. Which multi-level model has greater risks if its assumptions are violated and why?