PSY 610: STRUCTURAL EQUATION MODELING
Spring 2010, Mon 9:00 to 11:50 AM, Straub 180

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Straub 327
Office hours: Wed 11-12 or by appointment

This course is an introduction to structural equation modeling (SEM). SEM is a general framework for building, comparing, and evaluating theory-driven models of data. SEM can be used to test a variety of complex hypotheses about measurement, association, causation, and change over time. Specific techniques that are part of SEM include path analysis, confirmatory factor analysis, causal models with latent variables, growth curve models, and various techniques for modeling temporal dynamics. SEM is useful in a wide variety of research applications, including the analysis of experiments and interventions, observational designs, and designs with repeated measurements (such as within-subjects experiments, longitudinal studies, and multiple time series).

The course will begin by covering principles of causal inference, followed by an accelerated review of multiple regression with an emphasis on model building and comparison. The majority of the course will cover "classical" SEM applications like confirmatory factor analysis and causal modeling of between-subjects, cross-sectional data. These classical applications are the building blocks for more modern developments which we will cover as time permits, such as techniques for modeling data from repeated measures and longitudinal designs. Class meetings will include both classroom lectures and hands-on practice in the computer lab.

Prerequisites: Completion of PSY 611, 612, and 613. (Students who wish to take this course concurrently with 613 should contact the instructor.)

Software

All examples and exercises in class will be done using Mplus, which is installed on the computers in Straub 180. Students can also purchase a discounted copy of Mplus for their own computers (see www.statmodel.com). The free demo version available on their website is too restricted to be useful for this course.

Readings

Required text:

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford.

Optional text:

Bollen, K.A. (1989). *Structural equations with latent variables.* New York: Wiley-Interscience.

In addition to these texts, you will be assigned a number of required articles and chapters. See the section labeled "Schedule and Readings" for a list.

Grading and course requirements

40% Participation, in-class exercises, and homework
60% Final project (due Friday, June 4)

Final project. For the final project, you will have a choice of submitting either a *proposal* or a *data analysis writeup.* If you do a proposal, you will propose an application of SEM in a dataset that you might collect in the future. (This may be already-existing data, or it may be data that you would collect.) In a data analysis writeup, you will actually analyze some data and write up what you did and found out. More details will be given in class. Before you start your project, you should read:

McDonald, R. P., & Moon-Ho, R. H. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7,* 64-82.

Disabilities

If you have a documented disability and anticipate needing accommodations in this course, please contact Disability Services (http://ds.uoregon.edu) and make arrangements to meet with me as soon as possible. You will need to provide me with a letter from DS indicating what accommodations are needed.

Changes

Topics, readings, course requirements, or other aspects of this course may be changed at the instructor's discretion at any time. Changes will be announced in class or on the course website.

SCHEDULE AND READINGS

Always complete readings before the class meeting where we cover a topic. The tentative plan is to cover 1 topic per week; however, our actual progress may be faster or slower depending on the pace of our class meetings.

Topic 1
Introduction; principles of causal inference

Kline, ch. 1-4

Bollen (1989) chapter 3.

West, S. G., & Thoemmes, F. (2010). Campbell's and Rubin's perspectives on causal inference. *Psychological Methods, 15,* 18-37.

Optional

Holland, P. W. (1986). Statistics and causal inference. *Journal of the American Statistical Association, 81,* 945-960.

Topic 2
Regression as statistical modeling

Rodgers, J. L. (2010). The epistemology of mathematical and statistical modeling: A quiet methodological revolution. *American Psychologist, 65,* 1-12.

Judd, C. M. (2000). Everyday data analysis in social psychology: Comparisons of linear models. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in personality and social psychology* (pp. 370-392). New York: Cambridge.

Topic 3
Models with observed variables (mediation and path analysis)

Kline, ch. 5-6

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7,* 422-445.

Bullock, J. G., Green, D. P., & Ha, S. E. (in press). Yes, but what's the mechanism? (Don't expect an easy answer). *Journal of Personality and Social Psychology.*

Optional – will be discussed in class

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7,* 147-177.

Topic 4
Measurement models (a.k.a. confirmatory factor analysis)

Kline, ch. 7

John, O. P., & Benet-Martinez, V. (2000). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in personality and social psychology* (pp. 339-369). New York: Cambridge.

Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods, 5,* 155-174.

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the questions, weighing the merits. *Structural Equation Modeling, 9,* 151-173.

Topic 5
Structural models with latent variables

Kline, ch. 8

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103,* 411-423.

Rigdon, E. E. (1995). A necessary and sufficient identification rule for structural models estimated in practice. *Multivariate Behavioral Research, 30,* 359-383.

Topic 6
Not so fast! Challenges to inference and interpretation

Gelman, A. (in press). Causality and statistical learning. *American Journal of Sociology*.

MacCallum, R. C., Wegener, D. T., Uchino, B. N., & Fabrigar, L. R. (1993). The problem of equivalent models in applications of covariance structure analysis. *Psychological Bulletin, 114,* 185-199.

MacCallum, R. C., Roznowski, M., & Necowtiz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization of chance. *Psychological Bulletin, 111*, 490-504.

Topics 7-10

Topics and readings TBA, depending on (a) how quickly we've gotten to this point and (b) class interest. Possible topics include:

* Causal loops
* Growth curve models
* Other models for development and change
* Multiple groups models
* Advanced measurement topics