

# SEM 2: Structural Equation Modeling

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## Grading

- Individual assignments: 50%
  - o First two assignments: 20%, third assignment: 10%
- Project: 50%

All three must have an average grade of at least 5.5 to pass the course.

## Outline

### Week 1 – Introduction to Structural Equation Modeling

Monday May 8 – Lecture

- Covariance algebra
- Path analysis
- Structural equation modeling

Wednesday May 10 - Practical

### Week 2 – Causality and equivalent models

Monday May 15 - Lecture

- Causality
- Equivalent models
- Mediation

Wednesday May 17 – Practical

### **Week 3 – Latent variable models and network models**

Wednesday May 22 - Lecture

- Part 1: Generalized network psychometrics
- Part 2: Guest lecture by Abe Hofmann

Wednesday May 24 – Practical

### **Week 4 - Presentations**

Monday May 29

- Presentations of final project

Wednesday May 31

- Presentations of final project

**Friday June 2 (23:59:99): DEADLINE FINAL PROJECT REPORTS**

## Final Project

You have three options for this assignment. The first option is done alone; the second can be done alone or in a pair and the third option should be done in pairs. Every topic can only be done by one group! Post on blackboard to claim your topic!

1) If you have your own data, do an SEM analysis. Only choose this option if your data are really best analyzed via SEM, you plan to publish this analysis or some version of it on future data, and your analysis is otherwise “real” and not contrived. Consider all issues discussed in class: nonnormality, missing data, fit, model modification, difference tests, equivalent models, exploring different measurement models for a scale, etc. Apply as many learned concepts as possible. Report on the results via a short written report (about 4 double spaced pages in APA style, concisely written). This is your chance to apply everything you learned and get real feedback. This option may or may not include a 5-10 minute presentation to the class, depending on how many people choose it and time constraints.

2) Write a clear manual for using semPlot or for performing SEM analyses in Jasp, Onyx or Lavaan. Your manual will be shared online in this case. You can choose to also present your work, but this is not mandatory. There is no limit on how large your manual is, but should at least cover the fitting or drawing of multiple SEM models.

3) Research an area or a topic of SEM in more detail. Pick any issue that interests you. Your task is to find several articles that address this issue and to summarize them intelligently (some examples follow). Your reference list should have no fewer than 5 articles (books can be added but cannot be substituted for articles). You will report on the results of your research via 1) a presentation to the class (10 minutes plus questions), and 2) a 2-page summary report of findings (not counting references). Think of your goal as to teach yourself something that we didn't have time to learn in class, and then to teach it to the class. This option must be done in pairs<sup>1</sup>.

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<sup>1</sup> A very important note on plagiarism: When working in pairs, it sometimes happens that one partner copies some text from an article, then the other partner puts that text into the paper thinking that the first person wrote it, and they end up with a partially plagiarized paper. DO NOT LET THIS HAPPEN TO YOU. Plagiarism is a very big deal, and any cases will be caught and sent to the examination committee. It's best not to copy whole sentences from papers to begin with (take notes in your own words!), but if you do, be smart enough to put them in quotation marks and mark them with the source so you don't confuse yourself or your partner later. Both partners will be punished when plagiarism is detected.

Possible Subjects Include (but are not limited to):

1. Learn about an advanced type of SEM model, such as
  - Mixture models
  - MIMIC models
  - Growth-curve models
  - VAR models / Dynamic SEM
  - Multilevel SEM
  - Causal indicator Models
  
2. Learn about an advanced tool for SEM analysis, such as
  - Interactions among latent variables
  - Nonlinear relationships
  - LASSO regularization
  - Exploratory SEM
  - Bootstrapping standard errors (e.g., for mediation)
  - 2-stage estimation for nonnormal/missing data
  
3. Learn about a different latent variable model
  - Item response theory (IRT)
  - Latent class analysis
  - Latent profile analysis
  
4. Something more theoretical, such as
  - Interpretation of latent variables
  - Parsimony in SEM

Grading for the final project will be based on your presentation and your written report. The difficulty of your project will be taken into account.