

“Making Educational and Social Systems Work for All”
-- UO College of Education Mission Statement

EDLD 633 STRUCTURAL EQUATION MODELING I

4 Credits – CRN [17024](#)

University of Oregon – College of Education - Department of Educational Methodology, Policy, and Leadership

2011 Fall Term Syllabus

Meeting Days/Time: **Tuesdays 4:00-7:50 pm** (1600-1950)

Location: **Lokey 176**

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"All models are wrong, some are useful..." (George Box)

COURSE DESCRIPTION AND OBJECTIVES

EDLD 633 Structural Equation Modeling I is the first quarter of a two quarter sequence on Structural Equation Modeling (SEM). The goal of the course is to gain familiarity and build expertise in the use of latent variable models within a structural equation modeling framework. The course includes the use and interpretation of AMOS software (with some exploration of Mplus as well). Emphasis in the course is on the mastery of concepts and principles, development of skills in the use and interpretation of SEM software, and in the development of critical analysis skills in understanding research using the covered techniques. Topics covered will include path analysis, path diagramming, covariance structures, model specification and identification, parameter and model estimation, goodness of fit testing, estimation methods, regression models, confirmatory factor analysis, full SEM models, and invariance testing.

COURSE PREREQUISITES

Students should have the equivalent of a year of doctoral study in statistics including an intermediate graduate course in applied statistics before enrolling in this course. The ideal prerequisite courses are multiple regression (EDLD 642) and multivariate statistics (EDLD 644). Computer skills sufficient to allow proficient use of statistical software are also required to complete course work.

REQUIRED MATERIALS

Kline, R. (2010). *Principles and practice of structural equation modeling (3rd Ed.)*. New York: Guilford Press. ISBN 1606238760

Arbuckle, J. L. (2009). *Amos 18 User's Guide*. Crawfordville, FL: Amos Development Corporation.

A reading list of required articles will be also be assigned and distributed in class.

The software we will use is AMOS. AMOS is included in the SPSS graduate pack and full versions of AMOS are sold by SPSS/IBM. An older (version 5) free student version can be obtained from the author at: <http://amosdevelopment.com/download/>. The student version is sufficient to complete all course work. Information on Mplus is available at: <http://www.statmodel.com/index.shtml> and a free limited capacity version of the software is available at: <http://www.statmodel.com/demo.shtml>.

OTHER REFERENCES AND RESOURCES:

- Bollen, K.A. (1989). *Structural equations with latent variables*. New York: John Wiley & Sons.
- Bollen, K.A., & Long, J.S. (1993). *Testing structural equation models*. Newbury Park, CA: Sage.
- Byrne, B. M. (2009). *Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd Ed.)*. New York, NY: Routledge Academic.
- Byrne, B. M. (2011). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. New York, NY: Routledge Academic.
- Hoyle, R.H. (1995). *Structural equation modeling*. Thousand Oaks, CA: Sage.
- Jöreskog, K. G., & Sörbom, D. (1989). *LISREL 8 user's reference guide*. Chicago: Scientific Software International, Inc.
- Jöreskog, K. G., & Sörbom, D. (1989). *PRELIS 2 user's reference guide*. Chicago: Scientific Software International, Inc.
- Kaplan, D. (2000). *Structural Equation Modeling: Foundations and Extensions*. Thousand Oaks, CA: Sage.
- Loehlin, J. (1992). *Latent variable models (2nd Ed.)*. Hillsdale, NJ: Erlbaum.
- Marcoulides, G.A., & Schumacker, R.E. (1996). *Advanced structural equation modeling*. Mahwah, NJ: Erlbaum.
- Marcoulides, G.A., & Schumacker, R.E. (2001). *New Developments and Techniques in Structural Equation Modeling*. Mahwah, NJ: Erlbaum.
- Muthen, L.K., & Muthen, B.O. (2011). *Mplus user's guide (Version 6)*. Los Angeles, CA: Muthen & Muthen. Available as a pdf document at: <http://www.statmodel.com/download/usersguide/Mplus%20Users%20Guide%20v6.pdf>.
- Pedhazur, E. J. (1997). *Multiple regression in behavioral research (3rd Ed.)*. Orlando, FL: Harcourt Brace & Company.
- Raykov, T., & Marcoulides, G. A. (2006). *A first course in structural equation modeling (2nd Ed.)*. Mahwah, NJ: Erlbaum Associates.
- Schumacker, R. E., & Lomax, R.G. (2010). *A beginner's guide to structural equation modeling (3rd Ed.)*. Mahwah, NJ: Erlbaum Associates.

COURSE STRUCTURE AND REQUIREMENTS

EDLD 633 SEM I is organized in a seminar format. The major activities consist of a combination of lectures, group discussions, and software applications and interpretations. The course will cover an introduction to SEM with an emphasis on building, specifying, estimating and testing models, confirmatory factor analysis, invariance testing, full SEM models, and related techniques. For each topic, there will be readings in the required texts as well as supplementary assigned readings. Assignments include three homeworks and a brief paper as well as regular participation and discussion in the class. Students completing homework in Mplus as well as AMOS will receive 10% extra credit.

HOMEWORK

There are three homework assignments. These assignments will provide a basis for seeing the range of applications available in SEM, gaining experience and facility in running SEM software and interpreting output. All assignments must be completed on time to fulfill course requirements. A minimum of 10% will be deducted from late work.

PAPER

A brief paper is required that will provide the opportunity to build, test, interpret and report results of an SEM of the student's creation. Ideally the paper will use your own research ideas, data and a path analysis or Confirmatory Factor Analysis (CFA) model. There can be some flexibility in this requirement depending on class needs, but I envision a project that involves model building (i.e., specification and a path diagram) and that involves analyses of one's own data with some presentation and discussion of results with the group (if you do not have data, I will make data available). A preliminary one-page outline of the project along with a complete path diagram of the proposed model will be due November 1st. The final paper should be 5-10 pages, should use APA style, and provide a complete description of the results and interpretation of your CFA analysis. Additional details and a grading rubric are provided below. The paper due date is December 6th.

GRADING POLICY

Late work will be penalized a minimum of 10%. Work is due at the beginning of class on the due date. Homework and the paper may not be submitted electronically. Each student is responsible for submitting his/her own original work. Any instance of academic dishonesty (e.g., plagiarism) will result in a minimum of a score of zero for the assignment. Grading will be assigned on percentage of possible points, 90% and higher for an "A", 80-89% for a "B", etc. Work at the "C-" level or below is graded as an "F". Within each letter grade category, minus and plus grades will be awarded at the discretion of the instructor. Homework will count 70%, the paper will count 20%, and participation will count 10% of the course grade. Extra credit of 10% will be awarded to those who complete all homework assignments using AMOS and Mplus.

COURSE INCOMPLETES will be offered only rarely in unusual circumstances that truly prevent the student from completing course work during the regular course schedule. My policy on incompletes is more restrictive than the general UO policy. Incompletes will NOT be awarded simply because you have not been able to finish course work. Incompletes will only be awarded when there is a documented medical or similar unforeseen emergency that prevents the student from completing course work.

SCHEDULE OF TOPICS AND ASSIGNMENTS (schedule may change depending on our pace)

WEEK	TOPIC	ASSIGNMENT
1 September 27	Introduction, Overview of topics and course structure	Kline 1-4, AMOS 1-65 (AMOS page numbers refer to the AMOS 18 User's Guide)
2 October 4	Path Analysis, SEM models with observed variables	Kline 5-6, AMOS 67-79
3 October 11	Model Specification, Identification, and Testing	Kline 7, AMOS 81-99 <u>Homework 1 Due</u>
4 October 18	Evaluating Model Fit	Kline 8 AMOS 101-127 & Appendices

5 October 25	Introduction to factor analysis	Kline 9; AMOS 137-144
6 November 1	Measurement Models and CFA	<u>Homework 2 Due</u> <u>Paper Outline and Diagram Due</u>
7 November 8	Invariance Testing	Kline 11; AMOS 159-207
8 November 15	Invariance Testing Continued	AMOS 363-375
9 November 22	Full Models and Other Applications	Kline 10 <u>Homework 3 Due</u>
10 November 29	Issues in SEM	Kline 13
11 December 6	Finals Week	<u>Paper due</u>

COURSE POLICIES

ATTENDANCE POLICY

Attendance is required to succeed in this course and master the course material. If a student does miss class, it is the student's responsibility to get class notes, and handouts or other distributed materials. Contact the instructor in case of illness or emergencies that preclude completing assignments as scheduled or attending class sessions. Messages can be left on the instructor's voice mail or e-mail at any time of the day or night, prior to class. If no prior arrangements have been made before class time, the absence will be unexcused.

ACADEMIC MISCONDUCT POLICY

All students are subject to the regulations stipulated in the UO Student Conduct Code (<http://www.uoregon.edu/~conduct/>). This code represents a compilation of important regulations, policies, and procedures pertaining to student life. It is intended to inform students of their rights and responsibilities during their association with this institution, and to provide general guidance for enforcing those regulations and policies essential to the educational and research missions of the University.

CONFLICT RESOLUTION

Several options, both informal and formal, are available to resolve conflicts for students who believe they have been subjected to or have witnesses bias, unfairness, or other improper treatment. It is important to exhaust the administrative remedies available to you including discussing the conflict with the specific individual, contacting the Department Head, or within the College of Education, you can contact Joe Stevens, Associate Dean for Academic Affairs, at 346-2445 or stevensj@uoregon.edu or Surendra Subramani, Diversity Coordinator, at 346-1472 or surendra@uoregon.edu.

Outside the College, you can contact:

UO Bias Response Team: 346-1139 or <http://bias.uoregon.edu/whatbrt.htm>
Conflict Resolution Services 346 -0617 or <http://studentlife.uoregon.edu/programs/crs/>
Affirmative Action and Equal Opportunity: 346-3123 or <http://aaeo.uoregon.edu/>

DIVERSITY

It is the policy of the University of Oregon to support and value diversity. To do so requires that we:

- respect the dignity and essential worth of all individuals.
- promote a culture of respect throughout the University community.
- respect the privacy, property, and freedom of others.
- reject bigotry, discrimination, violence, or intimidation of any kind.
- practice personal and academic integrity and expect it from others.
- promote the diversity of opinions, ideas and backgrounds which is the lifeblood of the university.

DOCUMENTED DISABILITY

Appropriate accommodations will be provided for students with documented disabilities. If you have a documented disability and require accommodation, arrange to meet with the course instructor within the first two weeks of the term. The documentation of your disability must come in writing from the Disability Services in the Office of Academic Advising and Student Services. Disabilities may include (but are not limited to) neurological impairment, orthopedic impairment, traumatic brain injury, visual impairment, chronic medical conditions, emotional/psychological disabilities, hearing impairment, and learning disabilities. For more information on Disability Services, please see <http://ds.uoregon.edu/>

EXPECTED CLASSROOM BEHAVIOR

Classroom expectations include:

- Participating in class activities
- Respecting the diversity of cultures, opinions, viewpoints in the classroom
- Listening to fellow students, professors, and lecturers with respect
- Arriving on time, prepared for class
- Attending for the duration of class
- Not reading other materials, books, newspapers, or using laptops for other activities
- Turn off cell phones and other electronic devices
- Racist, homophobic, sexist, and other disrespectful comments will not be tolerated

GRIEVANCE

A student or group of students of the College of Education may appeal decisions or actions pertaining to admissions, programs, evaluation of performance and program retention and completion. Students who decide to file a grievance should follow the student grievance procedure, or alternative ways to file a grievance outlined in the Student Grievance Policy (<http://education.uoregon.edu/feature.htm?id=399>) or enter search: student grievance.

INCLEMENT WEATHER

In the event the university operates on a curtailed schedule or closes, UO media relations will notify the Eugene-Springfield area radio and television stations as quickly as possible. In addition, a notice regarding the university's schedule will be posted on the UO main home page (in the "News" section) at <http://www.uoregon.edu>.

If an individual class must be canceled due to inclement weather, illness, or other reason, a notice will be posted via email. During periods of inclement weather, please check your email rather than contact department personnel. Due to unsafe travel conditions, departmental staff may be limited and unable to handle the volume of calls from you and others. be limited and unable to handle the volume of calls from you and others.

EDLD 633 SEM: Research Paper Scoring Rubric

The purpose of the research paper is to provide experience in using, interpreting and reporting the results of SEM models. The paper must represent the original analysis of data that you have not done before. This does not mean that you cannot use existing data or use a study on which you have previously conducted analyses; it means you need to conduct new analyses not attempted before. For the analysis, you must use either a path analysis or CFA model. The paper should be 5-10 pages in length (you will lose points for exceeding the page limit), should use APA style (6th Edition), and should include the following elements. In grading, points for the different sections of the paper will be awarded as indicated by the numbers in parentheses.

- Introduction section (approximately one page) to describe the context and purpose of the study (5)
- A concise methods section (approximately one page) to describe the sample, the measured variables, and the procedures for data collection (10)
- A complete and thorough results section including tables and figures in APA style as necessary. At least one figure and one table of results including parameter estimates are required. Report of results should include screening of data, treatment of missing data, testing of model assumptions, complete reporting of the SEM model(s) including discussion and interpretation of relevant coefficients, interpretation of strength of association or power as needed, and interpretation of goodness of fit and variance explained (50)
- A concise discussion section (1-2 pages) that describes study limitations, interprets the results, discusses implications of the study (25)
- References in APA style as well as general style, coherence of writing, and correct use of APA style for the whole paper (10)

The paper is due Tuesday, December 6th.