

EDRS 797: Applications of MLM and HLM

Spring 2015 Wed. 4:30- 7:10 PM Thompson Hall Room L014



Instructor: Angela Miller, Ph.D.

Office: West Building Room 2105

Office Hours: Wednesday 2:30- 4:00 PM or by appointment (please email).

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Prerequisite: Successful completion of EDRS 821 (knowledge of multiple regression methods).

Course Description: This course will provide advanced study of applications of MLM and SEM. This will include an overview of the most common types of multi-level models and structural equation models that appear in educational research studies. Students will learn through a combination of text reading assignments, critical analysis of professional journal articles, and hands-on experience in using a computer program for data analysis, and application activities. Students will be expected to identify and report on quantitative methods used in published research, to analyze data using appropriate software, and to provide written reports of methodology and results.

Course goals: This course is a one-semester introduction to two widely used advanced quantitative methods. By the end of the semester, it is expected that you will be able to:

- Demonstrate a conceptual understanding of MLM and HLM as evidenced by your ability to select and justify the model that is appropriate to test a particular hypothesis, explain what the procedure is accomplishing and the logic underlying the given procedure.
- Explain what is meant by MLM and SEM and demonstrate the ability to use multiple techniques that are introduced in this class.
- Explain the assumptions of the above analyses and make recommendations when assumptions are violated.
- Conduct SEM and HLM using SPSS/AMOS software, including testing the assumptions of the technique, interpret the results of the output and write the results in APA publication style.

Format: The class sessions will include lecture, hands-on computer work and work nights.

Required Materials:

(1) Two required texts:

Kline, R. B. (2010). *Principles and Practice of Structural Equation Modeling* (3rd Ed.). New York, NY: Guildford Press.

Hox, J. (2010). *Multilevel Analysis: Techniques and Applications* (2nd Ed.). New York, NY: Routledge.

(2) Access to SPSS and AMOS software. There are computer labs on campus that provide access to both. You can also access SPSS software through GMU's virtual computer library at www.vcl.gmu.edu. Information about how to use the virtual computer library is available at http://itservices.gmu.edu/services/view-service.cfm?customel_dataPageID_4609=5689. It is the student's responsibility to ensure access to software outside of class time as there will not be sufficient time in class to complete required assignments.

Recommended Resource:

American Psychological Association (2009). *Publication Manual of the American Psychological Association (6th edition)*. Washington, DC: APA.

Class Preparation: Information on course assignments and notes for class lectures are available on the course blackboard site.

Class Attendance & Participation: Students are expected to come to class on time, complete assignments, and participate in class discussions.

My Teaching Philosophy (in a nutshell) and Expectations

Many people tend to think of statistics as a static and "cut and dry" field when, in fact, it is neither. Advances in computing have enabled the rapid development of more sophisticated modeling tools. There is no way that you will ever know and understand all of them. What you need to understand are the basic assumptions underlying different models, how to select among them, and where to go to get information to learn more if you need something new.

As doctoral students, my main goal for you is to help you become *expert learners*. It is not realistic for me to be your only source of information, nor is it a viable learning model for the scientists and researchers that you are becoming. Make use of the many resources that are easily available on the web and work with one another.

The most important thing you can bring with you to class is a willingness to try to conceptually understand the material. *Please be active--ask questions and participate*. Outside of class, remember that reading statistical information takes a long time, and even when you read slowly and deliberately, you will need to go back and revisit it over and over. Many people find that this is not easy material; you should accept struggles as a normal part of the learning process.

ASSESSMENT:

Assignments (30%): Some assignments will require you work with data to replicate class or textbook analyses and/or run new analyses in a small group (2-4 students per group). The exercise may also include conceptual questions about the method to help you gain conceptual understanding as you work through the exercises. You may work together or individually on running the analysis; however your responses to the questions should be a collaborative effort. Your group will upload your annotated output (please cut and paste relevant output to Word) and responses on the Bb site.

Research Article Critiques (20%): You will evaluate a published application of multilevel modeling and one of structural equation modeling method. You are to choose an article published since 2006 in a major journal in your field of interest. The article you choose should be approved by the course instructor.

In the written critique, you are to do the following:

1. State the primary research question
2. Describe the data (e.g. “methods section” → N, missing data problems, measures used, sample)
3. Describe how SEM/MLM was used to address the primary research question.
4. Critique the presentation of the results (e.g. tables, figures, details about the analysis including centering of predictors, etc.).
5. State whether, in your opinion, SEM/HLM was appropriately chosen and why. Note any alternative analyses that might shed additional light on the research question.

Final Project (50%): The final paper for this class is the application of structural equation modeling or multilevel modeling to a research problem in your area of interest. The goal is to provide full information of the application of an HLM or SEM model to a set of data of your choosing. You should start working early in the semester; there are a series of checkpoints (CP) on the class schedule. The final paper should be of sufficient quality for a proposal submission to AERA (or other conference) and/or the beginnings of a manuscript to be submitted for publication.

Your project may be one of the following:

- Analysis of your own or faculty mentor’s data (assuming appropriate approvals are in place)
- A replication or extension of another author’s study (if public data)

Your paper should include the following:

1. A brief statement of the research question and hypotheses,
2. an abbreviated literature review (no more than 3 pages)
3. a detailed Methods section;
4. a detailed Results section;
5. a brief Discussion section.

*You will be asked to provide a basic description of the model you plan to test including a brief theoretical rationale. Class members will be asked to comment on and critique the proposed model.

GRADING SCALE:

Grades will be assigned based on the following:

A+	98-100%	B+	88-89%	C	70-79%
A	93-100%	B	83-87%	F	below 70%
A-	90-92%	B-	80-82%		

Final grades are based in the assessments described above. “Extra credit” is not available.

Late Assignments: *As a general rule, late assignments will not be accepted.* If you believe you have EXCEPTIONAL circumstances and wish to negotiate to have extra time to complete course work, you must discuss this with me before the day the assignment is due. (Negotiating means that you will be sacrificing a portion, perhaps substantial, of your grade for extra time).

GMU POLICIES AND RESOURCES FOR STUDENTS

- a. Students must adhere to the guidelines of the George Mason University Honor Code (See <http://oai.gmu.edu/the-mason-honor-code/>).
- b. Students must follow the university policy for Responsible Use of Computing (See <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- c. Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- d. The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance (See <http://caps.gmu.edu/>).
- e. Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester (See <http://ods.gmu.edu/>).
- f. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- g. The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing (See <http://writingcenter.gmu.edu/>).

PROFESSIONAL DISPOSITIONS

Students are expected to exhibit professional behaviors and dispositions at all times.

CORE VALUES COMMITMENT

The College of Education & Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website <http://gse.gmu.edu/>.

Tentative Schedule

	Class	Theme	Topic	Reading	Due
1/21	1	Why?	Intro and Review: Overview Cleaning Data	H: Chapter 1 K: Chapter 1,3	
1/28	2	How?	Correlation→Path Analysis	K: Chapter 5,6	CP 1:RQ/variables/ data set info
2/4	3		2-level MLM: ICC, random intercepts, reliability	H: Chapter 2, 4 Pdf	Assn #1 Due
2/11	4				CP 2: Methods draft (sample/measures)
2/18	5		Latent Variables: CFA, SEM, MLmeasurement	K: Chapter 9, 10	Assn #2 Due
2/25	6				CP 3: Literature review (brief)
3/4	7		Longitudinal Models	H: Chapter 5 K: Chapter 11	Assn #3 Due
3/11	8			Spring Break	
3/18	9	What?	Model Presentations <i>Work night</i>		Assn #4 Due
3/25	10	Explaining Troubleshooting Violations	Presenting Results	Selected Chapters from K and/or H that pertain to your model	
4/1	11		<i>Individual Meetings</i>		
4/8	12		<i>Work night</i>		
4/15	13		<i>Work night</i>		
4/22	14		<i>Individual Meetings</i>		CP 5: Results
4/29	15		Wrapping Up /Writing Discussions <i>Work night</i>		
5/5			Reading Day		
5/6			Final Project Due		