EDRS 830: Hierarchical Linear Modeling
Fall 2013

Course Time: Thursday 4:30-7:10 p.m. Room 330 Innovation Hall
Instructor: Angela Miller, Ph. D.
Office Hours: 3:00-4:30 and by appointment
Office Hours Location: West Building, Room 2105
Email Address: amille35@gmu.edu
Office phone: 703-993-5590

Catalog Description: Hierarchical linear modeling (HLM) is an advanced quantitative method appropriate for analyzing nested data structures as well as student growth. Students will learn through reading assignments, lecture and applications using a computer program for data analysis. Students will be expected to critically read multilevel methods used in published research, analyze data, and provide written report of results in APA format.

Full Course Description: The purpose of this course is an introduction to hierarchical linear modeling (HLM) appropriate for analyzing nested data structures (e.g. students nested within classrooms) as well as student growth (linear growth models). The content is especially pertinent to applications of quantitative methods in the practice of educational research. The course will reinforce and build upon concepts and skills acquired in EDRS 811 and ESRS 821. Students will learn through a combination of reading assignments, hands-on experience in using a computer program for data analysis, and application activities. Students will be expected to critically read advanced quantitative methods used in published research (i.e., HLM and growth models), to analyze data, and to provide written report of methodology and results in APA format.

Prerequisite: Successful completion of EDRS 821 (or its equivalent) or permission of instructor.
Note: The first 2 weeks of the semester will be a review of multiple regression concepts that that you have already been exposed to (cleaning data, assumptions, multivariate normal distribution).

Required Materials:
(1) Snijders, T.A.B.,& Bosker, R.J. (2012). Multilevel Analysis, (2nd ed.). London, England: Sage Publications
(2) Garson, G. D. (Ed.). (2013). Hierarchical Linear Modeling. Guide and applications. London, England: Sage Publications.

(3) Access to SPSS and SAS software. There are computer labs on campus that provide access to SPSS and SAS. You can also access this 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 SPSS outside of class time as there will not be sufficient time in class to complete required assignments.

Course Goals: This course is a one-semester advanced statistics course design to introduce students' to multilevel modeling (MLM) techniques and an introduction to growth curve analyses. By the end of the semester, it is expected that you will be able to:

(1) Understand basic concepts, terminology, and assumptions pertinent to HLM; random coefficient models (2- and 3-level models) and growth models;

(2) Compare and contrast hierarchical linear modeling with other commonly used statistical procedures such as multiple regression analysis and repeated measures;
(3) Understand and implement the criteria associated with decisions made at each phase of a HLM analysis;
(3) Understand and critique research studies that feature HLM analyses;
(4) Write up the results of HLM analyses.

Course Format: The class sessions will include lecture, small group discussion, applied lab instruction and discussion of software output. **Questions are encouraged**. The lab portion of the class will provide time for hands-on computer work that is directly related to the homework and course goals.

Class Preparation: Information on course assignments, weekly quizzes, and notes for class lectures are available on the course Blackboard site.

For assistance with Blackboard students may email courses@gmu.edu, call (803) 993-3141, or go to Johnson Center Rm 311 (office hours: 8:30 am-5 pm). For general technical assistance, students may call 9703) 993-8870 or go to the counter in Innovation Hall.

Class Readings: The readings for this course come from the required textbook as well as journals and other books which provide insight or examples of the topic. Readings, when possible, will be made available to you for download from the Blackboard course website.

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:

Exam (20%): There will be 1 exam consisting of short answer and output interpretation items similar to those from homework assignments. The exam will cover the basic concepts presented in class and in the readings.

Application & Analysis Wikis (35%): Each week you will work with data to replicate class or textbook analyses and/or run new analyses in a small group (2-3 students per group). The exercise will also include several 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 have a wiki workspace on the Bb site. At various time points throughout the semester, I will check in your progress, offer feedback, and score the work according the rubric provided.

Research Article Critique (15%): You will evaluate a published application of multilevel modeling. 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 multilevel modeling 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, multilevel modeling was appropriately chosen and why. Note any alternative analyses that might shed additional light on the research question.

Final Project (30%): The final paper for this class is the application of multilevel modeling to a research problem in your area of interest. The goal is to provide full information of the application of an HLM model to a set of data of your choosing. You should begin looking for an appropriate data set early in the semester.
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. a detailed Methods section;
3. a detailed Results section;
4. 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.

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTIONS:

Student Expectations:

- Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/honor-code/].
- Students must follow the university policy for Responsible Use of Computing (See http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/).
- 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/].
- 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.
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

Campus Resources

- 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 co workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].
- 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/].
- For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See http://gse.gmu.edu/].

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/.

Late Assignments: *As a general rule, late papers/projects 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).

Tentative Course Schedule

(note: some articles will be added along the way and this calendar is VERY tentative.)

Date	Class	Theme	Topic	Reading/Due	Due
8/29	1	Why HLM?	Course Info & Overview What is Nesting? Data appropriate for HLM Review: Cleaning Data, Multiple Regression Concepts	SB- Chapters 1&2 G-Chapters 1 &2 Review of 821 notes/text McCoach Articles	
9/5	2	Software	SAS		
9/12	3	How	Intra-Class Correlation Coefficient (ICC) Random Effects Model Random Intercept Model Reliability Estimates of random effects Random Coefficients models Model Building Centering Compositional effects Interpretation of the Model	SB-Chapters 3-6 G-Chapters 3-5 G-Examples Ch. 6-9	Wiki#1
9/19	4				
9/26	5				Wiki#2
10/3	6				
10/10	7				Wiki#3
10/17	8	Variation	Longitudinal Models	SB-Ch. 15 G-Example Ch.10	Wiki#4
10/24	9		*Work night—prepare for model presentation		Wiki#5
10/31	10	Explaining Why & Planning	Explained Variance	SB-Ch. 7	Present Model (1)
11/7	11		Diagnostics & Assumptions	SB-Ch. 8 & 10	Present Model (2)
11/14	12		Design of Studies & Power	SB-Ch. 11	
11/21	13	Other Variations & Related Topics	Extensions: Cross-classified, Logistic, & Complex Sampling (as time permits)	SB-Ch. 13, 14& 17	Article Critique Due
11/28			**No Class—Thanksgiving Break**		
12/5	14		Catch-up & Review Project Questions/Work		**Final Project Due by 12/9 5 pm**
12/12	15		**FINAL EXAM**		