Hierarchical Linear Models I

EDLD 628 – 4 Credits – CRN 26704
University of Oregon – College of Education
Department of Educational Methodology, Policy, and Leadership

2015 Winter Term Syllabus
Meeting Days/Time: Tuesday/Thursday 12:00-13:50
Eugene Location: Lokey 115

Instructor: Mark J. Van Ryzin
Department of Educational Methodology, Policy, and Leadership

E-mail: markv@uoregon.edu
Address: 102S Lokey Bldg
Office Hours: By appointment

DESCRIPTION
Introduction to multilevel modeling and hierarchical data structures, random and fixed effects, intercepts and slopes as outcomes models, estimation, centering, and the use and interpretation of HLM statistical software.

COURSE PREREQUISITES
Multiple regression and ANOVA

OBJECTIVES
The goal of the course is to gain familiarity and build expertise in the use of multilevel models. Emphasis is on the mastery of concepts and principles, the development of skills in the use of HLM software, and the development of critical analysis skills in understanding research using multilevel models.

TEXTBOOK

SOFTWARE
You can buy a license for HLM or use the free student version. The student version can be downloaded from: http://www.ssicentral.com/hlm/student.html. The student version is sufficient to complete all course work. Access to SPSS or a similar basic statistics software program is also required.

OTHER REFERENCES AND RESOURCES
UCLA maintains an excellent website on statistical computing that includes detailed support for numerous statistical programs and packages, including HLM6 (http://www.ats.ucla.edu/stat/). This website also provides examples of programming and results in HLM6 and citations for four other texts on hierarchical linear modeling: http://www.ats.ucla.edu/stat/hlm/examples/default.htm.
Materials from other HLM courses:
http://statlab.stat.yale.edu/help/workshops/HLMworkshop/
http://courses.education.illinois.edu/edpsy587/
http://psych.unl.edu/psycrs/944/

**OD (Optimal Design)** calculates power and optimal sample sizes for testing treatment effects and variance components in multisite and cluster randomized trials with balanced two-group designs, and in repeated measurement designs. Get the software and manual for free at:
http://www.wtgrantfoundation.org/resources/consultation-service-and-optimal-design

**COURSE STRUCTURE**
EDLD 628 HLM is organized in a seminar format. The major activities consist of a combination of lectures, group discussions, and software applications (i.e., lab). The course will cover an introduction to HLM with an emphasis on model building and testing and the proper interpretation and reporting of results. For each topic, there will be readings in the required texts and in some cases supplementary assigned readings. There will be no traditional quizzes or exams. Instead, the course requires completion of five assignments, three involving the analysis of data and two involving a critique of an HLM analysis in your field of substantive interest, as well as regular participation and discussion in the class. In-class analyses will be conducted on shared datasets that will be provided by the instructor.

This class relies heavily on in-class participation, particularly in analyses. Therefore, it is critical that you bring to class a laptop with HLM installed and wireless access so that you may participate fully in class analysis workshops.

**GRADING POLICY**
Your final grade will be based on the weighted sum of the points earned for each course activity/assignment. Final letter grades for the course will be calculated as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A+</td>
<td>100%</td>
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<tr>
<td>A</td>
<td>95-99.9%</td>
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<tr>
<td>A-</td>
<td>91-94.9%</td>
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<tr>
<td>B+</td>
<td>87-90.9%</td>
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<tr>
<td>B</td>
<td>83-86.9%</td>
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<tr>
<td>B-</td>
<td>78-82.9%</td>
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<tr>
<td>C+</td>
<td>73-77.9%</td>
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<td>C</td>
<td>69-72.9%</td>
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<tr>
<td>C-</td>
<td>66-68.9%</td>
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<td>F</td>
<td>&lt;66%</td>
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Please note that if this class is taken P/NP, 78% or higher is required to pass the class.

Your final grade for this course will be determined based on course activities as follows:

- Critique Assignment 1 (15 points) = 15%
- Critique Assignment 2 (25 points) = 25%
- Analysis Assignment 1 (20 points) = 20%
- Analysis Assignment 2 (20 points) = 20%
- Analysis Assignment 3 (20 points) = 20%

Assignments are due at the beginning of class. Please use email rather than paper.
First critique assignment (individual grade)
Identify three to four articles in your area of substantive interest that use HLM to explore organizational effects or individual growth or both. (Please do not include papers that use meta-analysis). Please submit a paper or electronic version of the articles and a 3-4 page review of the articles that addresses the following questions:

- What is your area of substantive interest?
- List the articles in APA format. Which article did you find most interesting and why?
- What is the structure of the data in each article (i.e., how many levels, nested how, and representing what)?
- Did the authors defend the decision to use HLM? If so, how?
- What were the research questions of the articles?
- Write out the HLM models and describe the fixed and random effects. How did the authors determine whether to use fixed or random effects in each case?
- What were the findings? How appropriate was the analysis given the research questions and data? What other approaches might have been used instead?

Second critique assignment (team or individual grade)
Groups of two students will choose an article to present and critique “conference-style”. Presentations will be 15 minutes and should include research questions, structure of data, modeling decisions, and final model results, as well as a critique of the suitability of the methods and the analytical decisions given the research questions and data. Results should be presented in table and/or graphical form as best suits your conclusions and critique. Group members will receive the same grade. Students will be allowed to complete the assignment as an individual if they so choose. Presentations can be prepared in PPT. A written version of the critique will be submitted to the instructor along with the article.

First analysis assignment (team or individual grade)
You and a partner will submit a single paper in APA format with five parts: the theoretical background, your proposed research questions and hypotheses (supported by theory), a description of the dataset you will use, how you will use HLM to address your research questions, and the initial findings from descriptive analyses. In other words, this would be equivalent to the Introduction and Methods sections of a research paper, including the first paragraph of a Results section where correlations are reported (in a table). The Methods should include: a Participants section where you describe the sample; a Measures section where you describe the measures; and, an Analysis Plan where you describe HLM for the benefit of the reader (e.g., what does it provide that other analysis techniques don’t?); this section could also contain a representation of your hypothesized model (as we have written them in class) and should defend your decision to use HLM (e.g., with an ICC, for example).

Your research questions will form the foundation for your later assignments and should be informed by the descriptive analysis. You can use HLM or another statistical package (e.g., SPSS) to perform the descriptive analysis. This analysis should include reporting and interpretation of correlations between your outcome variable(s) and your predictors and control variables, as well as correlations among the predictors and control variables; as discussed above, please present these in a table in APA style. You should also report the range for each variable, the nature of the distributions (skewness, kurtosis, outliers) and, for categorical variables, the percentage of the sample in each category.
The instructor will provide feedback on the assignment which you should address in your later versions. Each analysis assignment will build upon and incorporate earlier versions; the end result will be a completed research paper that you can submit for publication.

**Second analysis assignment (team or individual grade)**
You and your partner will report on a series of basic models that you fit starting with an unconditional means model and arriving at a final hierarchical model (that is, a model in which all intended predictors and controls have been added). Your paper should include a discussion of the modeling decisions and trade-offs you made along the way. This would be similar to a full Results section of a published research paper. All results should be presented in tables using APA standards.

The instructor will provide feedback on this assignment which you should address in your final version to be handed in during finals week.

**Third (final) analysis assignment (team or individual grade)**
You will submit a final paper that utilizes your previous analysis assignment (i.e., Introduction, Methods, Results) along with a Discussion section that reviews the results and their implications for theory and practice in your field, discusses the limitations of the paper, and suggests new avenues for research. This section should directly address the research questions and hypotheses you presented initially, and when discussing implications for the field, you should refer back to the research that you surveyed in the Introduction.

**Scoring Rubric for Analysis Assignment**
The purpose of the research paper is to provide experience in interpreting and reporting the results of HLM 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 at least one unconditional and one conditional HLM model. The paper should be 15-30 pages in length including figures, tables, and bibliography, use APA style (6th Edition), and include the elements listed below.

- A concise Introduction section to describe the context and purpose of the study and a concise Methods section to describe the sample, the measured variables, and the procedures for data collection and analysis.

- A complete and thorough Results section including tables and figures in APA style as necessary. Reporting of results should include descriptive analysis of data, testing of model assumptions, complete reporting of the HLM model(s) including discussion and interpretation of relevant coefficients, interpretation of strength of association or power as needed, and interpretation of variance explained.

- A Discussion section that describes study limitations, interprets the results with regard to hypotheses, and discusses implications for theory and practice.
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<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading and Assignments</th>
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<tbody>
<tr>
<td>Week 1 (Jan 6)</td>
<td>Course introduction, review of regression models</td>
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<td>Week 1 (Jan 8)</td>
<td>Research questions and HLM notation</td>
<td>Raudenbush &amp; Bryk (RB) Chapter 1</td>
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<tr>
<td>Week 2 (Jan 13)</td>
<td>Intro to HLM and multilevel data structures</td>
<td>RB 2</td>
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<td>Week 2 (Jan 15)</td>
<td>Model-building in HLM</td>
<td>RB 4</td>
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<td>Week 3 (Jan 20)</td>
<td>Graphing, centering</td>
<td>RB 5 (pp. 99-117)</td>
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<td>Week 3 (Jan 22)</td>
<td>Explained variance</td>
<td>First Critique Due</td>
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<tr>
<td>Week 4 (Jan 27)</td>
<td>Graphing and model building</td>
<td>RB 5 (pp. 117-159)</td>
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<tr>
<td>Week 4 (Jan 29)</td>
<td>Graphing and model building</td>
<td>First Analysis Due</td>
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<tr>
<td>Week 5 (Feb 3)</td>
<td>Three level models</td>
<td>RB 8 (pp. 228-237)</td>
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<tr>
<td>Week 5 (Feb 5)</td>
<td>Three level models</td>
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<tr>
<td>Week 6 (Feb 10)</td>
<td>Longitudinal models</td>
<td>RB 6 (pp. 160-176, skim 176-185, 199-204)</td>
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<tr>
<td>Week 6 (Feb 12)</td>
<td>Longitudinal models</td>
<td>Second Analysis Due</td>
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<tr>
<td>Week 7 (Feb 17)</td>
<td>More growth models</td>
<td>RB 8 (pp. 237-245)</td>
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<td>Week 7 (Feb 19)</td>
<td>More growth models</td>
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<td>Week 8 (Feb 24)</td>
<td>Assumptions and assessing the adequacy of models</td>
<td>RB 9 (pp. 252-275)</td>
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<tr>
<td>Week 8 (Feb 26)</td>
<td>Assumptions and assessing the adequacy of models</td>
<td>Second Critique Due (written)</td>
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<tr>
<td>Week 9 (Mar 3)</td>
<td>Discontinuous growth and time-varying covariates</td>
<td>RB 6 &amp; 8 (pp. 176-185, 237-245)</td>
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<tr>
<td>Week 9 (Mar 5)</td>
<td>Discontinuous growth and time-varying covariates</td>
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<td>Week 10 (Mar 10)</td>
<td>Presentation of second critique</td>
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<td>Week 10 (Mar 12)</td>
<td>Presentation of second critique; in-class discussion of analysis assignments as needed</td>
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<td>Mar 16-20</td>
<td>Finals Week</td>
<td>Third Analysis Assignment Due Thursday at 5pm</td>
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**ATTENDANCE POLICY**
Contact the instructor in case of illness or emergencies that preclude completing assignments as scheduled or attending class sessions. Messages can be sent to the instructor's e-mail prior to class. If a student believes an exceptional arrangement is needed, the instructor will consider such a request on a case-by-case basis. To arrange such a special accommodation, students must contact the instructor two weeks in advance. If a class is missed, students are responsible for all lecture notes, assignments, handouts, and other materials missed during their absence. A missed class (or a late arrival to/early departure from class) will not be considered a legitimate excuse for not being prepared for an exam or avoiding late penalties on assignments.

**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
Note: Racist, homophobic, sexist, and other disrespectful comments will not be tolerated.

**COURSE INCOMPLETES**
Incompletes are given only in rare and extreme situations that truly prevent the student from completing course work during the regular course schedule. 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. For details on the policy and procedures regarding incompletes, please see: https://education.uoregon.edu/academics/incompletes-courses.

**ACADEMIC MISCONDUCT POLICY**
All students are subject to the regulations stipulated in the UO Student Conduct Code (http://conduct.uoregon.edu/). 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.
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://aec.uoregon.edu/

CONFLICT RESOLUTION
Several options, both informal and formal, are available to resolve conflicts for students who believe they have been subjected to or have witnessed 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 Angie Whalen, Assistant Dean for Academic Programs and Student Services, at 346-2898 or awhalen@uoregon.edu; Lauren Lindstrom, Associate Dean for Research and Academics, at 346-1399 or lindstrm@uoregon.edu; or Surendra Subramani, student advisor, 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
UO Conflict Resolution Services 346-0617 or https://uodos.uoregon.edu/Programs/ConflictResolutionServices.aspx
UO Affirmative Action and Equal Opportunity 346-3123 or http://aaeo.uoregon.edu/

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 (https://education.uoregon.edu/academics/student-grievance).
MANDATORY REPORTING
UO employees, including faculty, staff, and GTFs, are mandatory reporters of child abuse and prohibited discrimination. This statement is to advise you that that your disclosure of information about child abuse or prohibited discrimination to a UO employee may trigger the UO employee’s duty to report that information to the designated authorities. Please refer to the following links for detailed information about mandatory reporting:
http://around.uoregon.edu/mandatoryreporting
https://hr.uoregon.edu/policies-leaves/general-information/mandatory-reporting-child-abuse-and-neglect/presidents-message

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. Please use good judgment with respect to inclement weather and do not travel to class if road conditions are unsafe. Additional information is available at http://hr.uoregon.edu/policy/weather.html.