Educational Psychology 906/Child Language Program (CLP) 948: Latent Trait Measurement and Structural Equation Models

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Time:	TR 12:00–1:15	Office Hours:	F 9:00-11:00 in 455 Watson

Schedule of Topics and Events:

The online syllabus at the web address provided above will always have the most current information.

Course Objectives, Materials, and Pre-Requisites:

This course will contemporary approaches to measurement, expanding from classical test theory into confirmatory factor models, item response models, and their use within structural equation models. In addition to the statistical models, the course will also focus on the measurement concepts behind these models and how they relate to each other with respect to scale construction and evaluation. Class time will be devoted primarily to lectures and examples. Lecture materials in .pdf format will be available for download at the website above the day prior to class, or else paper copies can be requested. Video recordings of the class lectures will also be available online, but are not intended to take the place of class attendance. Selected book chapters and journal articles will be assigned for each specific topic as needed; the initial list of readings below may be updated. The course will have an applied focus using either R or M*plus*. Participants should be comfortable with the general linear model (analysis of variance, regression) and multivariate statistics (the multivariate normal distribution) prior to enrolling in this course.

Academic Honesty:

As a reminder, the University of Kansas has a formal policy on academic honesty. All assignments should be done **individually**, and all in-class assessments should be closed-note/book unless otherwise instructed.

Accommodating Students with Disabilities:

Students with disabilities or who have other special needs are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation.

Course Requirements:

Participants will have the opportunity to earn **up to 100 total points** in this course. Up to **88 points** can be earned from **homework assignments** (one due approximately every two weeks). Up to **12 points** may be earned from **participating in in-class learning assessments**, but you must be present in class to earn those points. There may be other opportunities to earn extra credit at the instructor's discretion.

Policy on Late Homework Assignments and Incompletes:

In order to be able to provide prompt feedback, **late homework assignments will incur a 3-point penalty.** However, extensions will be granted as needed for extenuating circumstances (e.g., conferences, family obligations) if requested **at least three weeks in advance of the due date**. As noted above, missed in-class quizzes cannot be made up. Finally, a final grade of "incomplete" will only be given in the event of extremely dire circumstances and at the instructor's discretion. Homework assignments that involve individual writing will have the opportunity to be revised ONCE to earn the maximum total points. Written assignments **must be at least ¾ complete to be accepted, and late revisions will incur a 1-point penalty.** No late points will be returned through the revision process. Please use "track changes" and retain all original instructor comments (unless otherwise instructed) so that I can easily see how your revisions address the comments.

Final grades will be determined by the *proportion* earned out of the total possible points:

>92 = A, 90–92 = A−, 87–89 = B+, 83–86 = B, 80–82 = B−, < 80 = C or no pass

Course Software:

Participants will need to have access to either *R* or M*plus* software, the latter of which is available in the GIS and Data Lab in 425 Watson Library, as well as remotely through the Academic Computing Facility. Individual student licenses can also be purchased from the statmodel.com ($350 each). R can be downloaded from http://www.r-project.org. If using R, I recommend the RStudio GUI http://www.rstudio.com.

Course Readings (all available via "Course Documents" on OneDrive):

Bauer, D. J., & Hussong, A. M. (2009). Psychometric approaches for developing commensurate measures across independent studies: Traditional and new models. *Psychological Methods, 14*(2), 101-125.

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed). New York, NY: Guilford.

Chen, F., F., West, S. G., & Sousa, K. H. (2006). A comparison of bifactor and second-order models of quality of life. *Multivariate Behavioral Research, 41*, 189-225.

Curran, P. J., McGinley, J. S., Bauer, D. J., Hussong, A. M., Burns, A., Chassin, L., Sher, K., & Zucker, R. (2014). A moderated nonlinear factor model for the development of commensurate measures in integrative data analysis. *Multivariate Behavioral Research, 49*(3), 214-231.

Embretson, S. E., & Reise, S. T. (2000). *Item response theory for psychologists*. Mahwah, NJ: Erlbaum.

Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: Guilford.

John, O. P., & Benet-Martinez, V. (2014). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 473-503, 2nd ed.). New York, NY: Cambridge University Press.

MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. New York, NY: Routledge Academic.

Maydeu-Olivares, A. (2015). Evaluating the fit of IRT models. In S. P. Reise & D. A. Revicki (Eds.), *Handbook of item response theory modeling* (pp. 111-127). New York, NY: Taylor & Francis.

Maydeu-Olivares, A., & Coffman, D. L. (2006). Random intercept item factor analysis. *Psychological Methods, 11*, 344-362.

McDonald, R. P. (1999). *Test theory: A unified treatment*. Mahwah, NJ: Erlbaum.

Mungas, D., & Reed, B. R. (2000). Application of item response theory for development of a global functioning measure of dementia with linear measurement properties. *Statistics in Medicine, 19*, 1631-1644.

Preacher, K. J., & MacCallum, R. C. (2003). Repairing Tom Swift's electric factor analysis machine. *Understanding Statistics, 2*(1), 13-43.

Reise, S. P. (2012). The rediscovery of bifactor measurement models. *Multivariate Behavioral Research, 47*, 667-696.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*(1), 4-69.

Wirth, R. J., & Edwards, M. C. (2007). Item factor analysis: Current approaches and future directions. *Psychological Methods, 12*(1), 58-79.

Tentative Schedule of Events:

Week	Date	Topics	Readings
1	22-Aug	Lecture 1: Introduction to Latent Trait Measurement and Structural Equation Modeling	John & Benet-Martinez (2014)
	24-Aug	Lecture 2: Exploratory Factor Analysis and Principal Components Analysis	
	25-Aug	**No Homework Due**	Preacher & McCollum (2003)
2	29-Aug	Lecture 3: Classical Test Theory for Scale Reliability and Validity	McDonald (1999) ch. 5-7
		Example 3: Classical Items Analysis in R	
	31-Aug	Lecture 3 and Example 3, continued	
	1-Sep	**HW0 Due by 11:59pm**	
3	5-Sep	Lecture 4: Confirmatory Factor Analysis	Brown ch. 3-5
		Example 4: Confirmatory Factor Analysis in the R package lavaan and in Mplus	
	7-Sep	Lecture 4 and Example 4, continued	
	8-Sep	**HW1 Due by 11:59pm**	
4	12-Sep	Lecture 4 and Example 4, continued	Enders (2010) ch. 3-5
	14-Sep	Lecture 4 and Example 4, continued	
	15-Sep	**No Homework Due**	
5	19-Sep	Lecture 5: Introduction to Generalized Models	E & R (2000) ch. 3-4
	21-Sep	Lecture 6: Latent Trait Measurement Models for Binary Responses	Mungas & Reed (2000)
	22-Sep	**HW2 Due by 11:59pm**	
6	26-Sep	Example 6: Binary Item Response Models in R and Mplus	E & R ch. 7-8
	28-Sep	NO CLASS	Wirth & Edwards (2007)
	29-Sep	**HW1 revision due by 11:59pm**	
7	3-Oct	Lecture 6 and Example 6, continued	Maydeu-Olivares (2015)
	5-Oct	NO CLASS	
	6-Oct	**HW3 Due by 11:59PM**	

8	10-Oct	Lecture 6 and Example 6, continued	
	12-Oct	Lecture 6 and Example 6, continued	
	13-Oct	**No Homework Due**	
9	17-Oct	NO CLASS (Fall Break)	
	19-Oct	Lecture 7: Latent Trait Measurement Models for Other Item Responses	E & R ch. 5
		Example 7: Graded Response Models for Ordinal Responses in R and Mplus	Bauer & Hussong (2009)
	20-Oct	**HW4 Due by 11:59pm**	
10	24-Oct	Lecture 7 and Example 7, continued	Brown ch. 7
	26-Oct	Lecture 8: Measurement Invariance in CFA and Differential Item Functioning in IRT/IFA	Vandenberg & Lance (2000)
	27-Oct	**HW3 revision due by 11:59pm**	
11	31-Oct	Example 8a: Multiple-Group Measurement Invariance in CFA using Mplus and R	Curran et al. (2014)
	1-Nov	Example 8b: Multiple-Group Measurement Invariance in IFA using Mplus and R	
	2-Nov	**HW5 due by 11:59pm**	
12	7-Nov	Lecture 9: Higher-Order and Method Factor Models	Brown ch. 8
	9-Nov	Example 9: Higher-Order CFA and IRT Models in Mplus and R	Maydeu-Olivares & Coffman (2006)
	10-Nov	**No Homework Due**	Reise (2012)
13	14-Nov	Lecture 10: Path Modeling and Mediation	MacKinnon (2008) ch. 6
	16-Nov	Example 11a: Path Modeling with Mediation in Mplus	
	17-Nov	**No homework Due**	
14	**21-Nov**	**NO CLASS; HW 6 due by 11:59pm**	
	23-Nov	NO CLASS (Thanksgiving Break)	
15	28-Nov	Example 11b: Path Modeling with Non-Normal Outcomes in Mplus	
	30-Nov	Lecture 12: Structural Equation Modeling	
	1-Dec	**HW7 due by 11:59pm**	
16	5-Dec	Example 12: Structural Equation Modeling in Mplus and R	
	7-Dec	Lecture 12 and Example 13, continued	
	8-Dec	No homework Due	
17	**15-Dec**	**All homework revisions due by 11:59pm**	