EVAL 6970: Meta-Analysis

Fall 2013

Course Description

This course is an advanced graduate seminar designed to provide students with the knowledge, skills, and abilities necessary to conduct basic research reviews, research syntheses, and meta-analyses. Topics covered include, but are not limited to, the increasing use of meta-analysis in formulating and enacting evidence-based policies and practices, the role of meta-analysis in theory development, principles and procedures for planning and executing research reviews and meta-analyses, identifying and retrieving literature, coding studies, computing effect sizes (e.g., based on means, binary data, and correlations) and their corresponding confidence intervals for meta-analysis, converting among effect sizes, factors that affect precision (e.g., variance, standard error, confidence intervals), fixed-effect and random-effects models for meta-analysis, identifying and quantifying heterogeneity, prediction intervals, subgroup analysis, meta-regression, meta-analysis with complex data structures (e.g., independent subgroups, multiple outcomes or time points), power analysis for meta-analysis, publication bias, and psychometric meta-analysis. Students should have a fundamental knowledge of applied statistics and research design to succeed in the course and will be required to plan and execute a basic meta-analysis. EMR 6550: Experimental and Quasi-Experimental Designs, or an equivalent course, is a recommended, but not required, prerequisite.

Credit and Course Hours

3 semester hours

This class meets from 5:30 PM – 8:00 PM on Thursdays beginning September 5, 2013 and ending December 12, 2013.

The course meets in Sangren Hall, room 1740.

Instructors

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Course Website

The website for this course is located at http://evaluation.wmich.edu/phd/courses/meta-analysis. From this site students can access assigned readings, data sets, spreadsheets, and other materials related to the course.

eLearning

The website for eLearning is located at https://elearning.wmich.edu/. Students should submit all homework and project assignments via eLearning by 5:00 PM on their due date. *No late homework or projects will be accepted*

Office Hours

By appointment.

Course Objectives

This course has multiple student learning objectives. Students will be expected to develop the following knowledge, skills, and abilities:

1. An understanding of the increasing importance of, applications and uses of, and recognition of meta-analysis for formulating and enacting evidence-based policies and practices
2. An ability to plan and execute a basic meta-analysis
3. An ability to compute a variety of effect sizes for use in meta-analysis
4. An ability to compute variances, standard errors, and confidence intervals for use in a meta-analysis and an understanding of their influence on summary statistics typically reported in a meta-analysis

5. An ability to convert among different types of effects sizes (e.g., from a log odds ratio to *d* or from *d* to a log odds ratio)
6. Understanding the differences between fixed- and random-effects models for meta-analysis, their assumptions, interpretations, and when each is appropriate
7. An ability to identify and quantify heterogeneity in the context of a meta-analysis
8. An ability to identify how statistical power is affected by moving from primary studies to a meta-analysis and how to extend statistical power concepts to meta-analysis
9. An ability to statistically model publication bias and its impact on a meta-analysis
10. An ability to execute a meta-analysis in the Comprehensive Meta-Analysis 2.0 software package

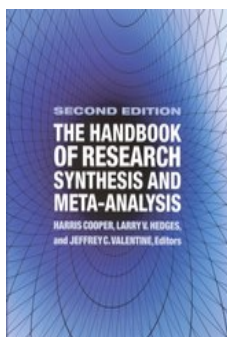## Required Textbooks and Readings

Two textbooks are required for this course. In addition, students are required to read, reflect on, and critically assess several other required readings. Additional readings may be assigned.

Required Textbooks

The textbooks required for this course are:
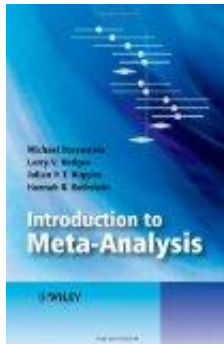
Bornenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. West Sussex, UK: Wiley.

Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.). (2009). *The handbook of research synthesis and meta-analysis* (2nd ed.). New York, NY: Russell Sage Foundation.

Additional Readings

The following readings are required in addition to the two required textbooks, and are available from the course website in PDF format:

Anderson, C. A., et al. (2010). Violent video game effects on aggression, empathy, and prosocial behavior in eastern and western countries: A meta-analytic review. *Psychological Bulletin*, *136*(2), 151-173.

Beretavs, S. N. (2010). *Meta-analysis*. In G. R. Hancock, G. R. R. O. & Mueller (Eds.), The reviewer's guide to quantitative methods in the social sciences (pp. 255-264). New York, NY: Routledge.

Bornmann, L., diger Mutz, R., & Daniel, H-D. (2010). A reliability-generalization study of journal peer reviews: A multilevel meta-analysis of inter-rater reliability and its determinants. *PLoS ONE*, 5(2), e14331.

Cook, T. D., & Leviton, L. C. (1980). Reviewing the literature: A comparison of traditional methods with meta-analysis. *Journal of Personality*, *48*(4), 449-472.

DuBois, D. L., Holloway, B. E., Valentine, J. C., & Cooper, H. (2002). Effectiveness of mentoring programs for youth: A meta-analytic review. *American Journal of Community Psychology*, *30*(2), 157-197.

Peterson, J. L., & Shibley Hyde, J. (2010). A meta-analytic review of research on gender differences in sexuality, 1993–2007. *Psychological Bulletin*, *136*(1), 21-38.

Schwandt, T. A. (2000). Meta-analysis and everyday life: The good, the bad, and the ugly. *American Journal of Evaluation*, *21*(2), 213-219.

Wilson, S. J., & Lipsey, M. W. (2000).Wilderness challenge programs for delinquent youth: a meta-analysis of outcome evaluations. *Evaluation and Program Planning*, *23*(1), 1-12.

Software Requirements

Comprehensive Meta-Analysis 2.0 is required for this course and the full version can be purchased for $95 for a one year lease at the student rate (through the instructor).

Course Components

Course grades will be based on (a) class attendance and participation, (b) homework performance, and (c) performance on a final project. Students should not put their names on homework or projects, but rather only use their WIN numbers, so that homework and projects can be graded blind to student identity.

Class Attendance & Participation

Students are expected to attend class regularly, participate in class discussions, and provide constructive feedback for others in the course. Thus, your overall class participation grade will be based on (a) voicing your reflections on the readings (e.g., by noting positive contributions and constructive criticisms), (b) getting others in the class involved (e.g., by asking questions, having stimulating discussion/debate), (c) contributing information and experiences that supplement the readings, (d) providing fair and balanced feedback to others, and obviously (e) attending class and being on time. Class attendance and participation is worth 10% of your course grade.

Students should bring a laptop computer to class as many class sessions will involve computations of effect sizes and other related activities. Additionally, students will be required to download a trial version (or purchase) of Comprehensive Meta-Analysis 2.0 to complete some problems.

Homework

Four homework assignments will be required in this class. Each homework assignment is worth 10% of your course grade and 40% combined. All homework assignments may be completed individually or in small groups with instructor approval.

1. **Homework #1.** Formulating a problem statement and reviewing the literature.
2. **Homework #2.** Coding and storing studies for analysis.
3. **Homework #3.** Computing effect sizes, variances, standard errors, and confidence intervals from studies.
4. **Homework #4.** Quantifying heterogeneity and publication bias.

Specific details regarding each homework assignment will be provided in class. Each homework assignment also will be integrated into the final project, so it is imperative to complete each homework assignment and incorporate the instructor's feedback on homework into the project.

No late homework will be accepted. All homework and projects must be submitted via eLearning by 5:00 PM on the day they are due.

Final Project

One final project will be given. This project is worth 50% of your course grade and is comprehensive and covers material presented for the entire semester. The final project may be completed individually or in small groups with instructor approval.

1. **Final Project Part 1 (take home).** This project is comprehensive and will require you to execute a small meta-analysis in Comprehensive Meta-Analysis 2.0 that includes a minimum of five primary studies. In doing so, you (or your group) will submit a complete write-up of the meta-analysis, including Introduction (including a clear statement of problem, rationale, and any specific questions and/or hypotheses investigated), Method, Results, and Discussion sections.

2. **Final Project Part 2 (in class).** Each individual or group will give a 15-minute PowerPoint-facilitated presentation of the meta-analysis completed in Part 1.

No late project (part 1 and part 2) will be accepted. All projects, including parts 1 and 2, must be submitted via eLearning by 5:00 PM on the day they are due.

Teaching Philosophy

Cognitive science suggests that students learn most effectively when they actively construct the meaning of material by articulating and applying the information. Consequently, this course emphasizes active learning.

- Before class, students will need to read material to be applied in class, and in particular they should learn the key terms and concepts for the assigned reading
- In the first half of the class, the instructor will lecture on the assigned material and related material as well as demonstrate statistical computations
- Students will do well in this course if they come prepared to ask questions about the material during this time
- In the second half of the class, students will engage in structured class exercises and computational activities

Course Schedule

Topics, readings, and assignments tentatively follow the schedule below. Due dates for class assignments (i.e., assessments) will not change, but dates for seminar topics might. All assignments are due by 5:00 PM on the date indicated in the course schedule.

Date	Topic	Readings	Assignments
September 5	Introduction to research reviews and meta-analysis	Syllabus INTRO Chapters 1 & 2 HANDBK Chapters 1	
September 12	Work with groups on literature search and problem statement	Bornmann, diger Mutz, & Daniel (2010)	
September 19	Formulating a problem, coding the literature, & review of research designs	HANDBK Chapters 2, 3, 4, 5, 6, 7, 8, 9, & 10 DuBois et al. (2002)	
September 26	Constructing relational databases and coding forms for meta-analysis	INTRO Chapter 3 HANDBK Chapter 17 Cook & Leviton (1980)	Homework #1
October 3	Effect sizes based on means, binary data, and correlations & factors that affect precision: Part I	INTRO Chapters 4, 5, 6, 7, 8, & 9 HANDBK Chapters 12, 13, & 14	
October 10	Effect sizes based on means, binary data, and correlations & factors that affect precision: Part II	INTRO Chapters 4, 5, 6, 7, 8, & 9 HANDBK Chapters 12, 13, & 14	Homework #2
October 17	*No class – AEA conference*		
October 24	Fixed-effect and random-effects models	INTRO Chapters 10, 11, 12, 13, & 14 HANDBK Chapters 15 & 16	
October 31	Heterogeneity & prediction intervals	INTRO Chapters 15, 16, 17, & 18	Homework #3
November 7	Sub-group analysis, meta-regression, & complex data structures	INTRO Chapters 19, 20, 21, 22, 23, 24, 25, & 26	
November 14	Psychometric meta-analysis & review of prior material	INTRO Chapter 38	
November 21	Vote counting, statistical power, & publication bias	INTRO Chapters 27, 28, 29, & 30 HANDBK Chapters 11 & 23	Homework #4
November 28	*No class – Thanksgiving*		
December 5	Interpretation & reporting results	INTRO Chapter 41 HANDBK Chapters 25, 26 & 27 Anderson et al. (2010) Peterson & Shibley Hyde (2010) Schwandt (2000)	
December 12	Student presentations		Final project and presentations of results

INTRO = *Introduction to meta-analysis*
HANDBK = *The handbook of research synthesis and meta-analysis*

Grading and Weighting of Course Components

Attendance & class participation	10%
Homework #1	10%
Homework #2	10%
Homework #3	10%
Homework #4	10%
Final Project	50%

Where:

100% – 95%	=	A
94% – 90%	=	BA
89% – 85%	=	B
84% – 80%	=	CB
79% – 75%	=	C
< 75%	=	F

Suggestions for Succeeding in this Course

There is an extensive amount of reading and several major work products required for this course and we will be covering several related and unrelated topics, with which you may or may not be familiar. Therefore, in order to succeed in this course it is imperative that you do not fall behind. (1) Carefully study and repeatedly read the books and other assigned readings. The concepts in this class are often complex, and learning to apply them is a crucial skill to acquire. Reading the book and assigned readings helps with both problems. (2) Organize and participate in a study group. Such groups can help you check your understanding of concepts and their application, and to see that you are doing assigned homework and other assignments correctly.

Need for Accommodation

Any student with a documented disability (e.g., physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the professor and the appropriate Disability Services office at the beginning of the semester. The two disability service offices on campus are: Disabled Student Resources and Services (269-387-2116) and the Office of Services for Students with Learning Disabilities (269-387-4411).

Diversity Statement

The IDPE maintains a strong and sustained commitment to the diverse and unique nature of all learners and high expectations for each student.

Academic Integrity

You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at http://www.wmich.edu/catalog under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty,

you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructors if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

To access the Western Michigan University Code of Honor and general academic policies on such issues as diversity, religious observance, and student disabilities, please visit http://osc.wmich.edu/ and www.wmich.edu/registrar.