UW URBDP 591A:

Research Design in Complex Settings:

Opportunities and Challenges of Interdisciplinary Collaborations

Course Description

DRAFT

Fall Quarter 2012 Gould 422
Tue-Thu 9:00-10:20

4 Credits

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Subject

This course is designed to provide graduate students in the applied social and natural sciences with theoretical and practical skills for conducting research in complex settings with a particular emphasis on integration and synthesis of theories, concepts, and data across disciplines. Research design will be framed as an emergent process. Students will be exposed to the issues involved in research decisions and to diverse problem-solving strategies at various stages of the research process. The course examines the logic of scientific inquiry, conceptualization and measurement of social and ecological phenomena in urbanizing systems, principles of research design, and alternative methods for describing, analyzing, and modeling primary and secondary data. Emphasis is given to statistical principles of research design hypothesis testing and statistical inference, sampling strategies, and analytical approaches to randomized experimental, quasi-experimental, longitudinal and cross-comparative studies. Major theoretical issues include: threats to internal validity, sampling and external validity, reliability of measures, causality, interpretation of statistical analysis and ethics in research. Students will learn how to frame a research question, develop testable hypotheses, identify and provide operational definitions of research variables, select appropriate analytical methods, evaluate alternative research designs, and develop capacity for syntheses. The course is structured around two components: a theoretical/methodological component and an applied research component. The theoretical component is organized around a series of lectures on research design. The applied research component focuses on concepts and insights emerging in the study of coupled human natural systems, and is designed as a series of interactive sessions with UW interdisciplinary research teams.

Prerequisites Introduction to statistical methods, including the basic idea of random sampling, basic probability laws, regression analysis, and statistical tests.

Course Structure and Assignments

This course is based on lectures and interactive sessions. Students are expected to actively prepare for and participate in the discussions. The interactive sessions focuses on concepts and insights emerging in the study of coupled human natural systems and will feature the participation of UW interdisciplinary teams. Focusing on their individual research topic, students are expected to develop a 15-page research design proposal which will articulate: a research question, testable hypotheses, appropriate research design and methods, and evaluation. In parallel to developing a research design paper, students will engage in a journal discussion through a collaborative research blog. Students are expected to produce a team-authored synthesis of key insights on four themes in interdisciplinary research: (1) framing a research question, (2) defining system boundaries, (3) dealing with uncertainty, and (4) synthesis.

Grading Criteria

Class Participation = 20%; Team-authored insights = 30%; Final Paper = 40%; Presentation = 10%

Readings

This course has a required reader and four recommended books. The papers are available on the class web site. The books are: Robert Alford (1998), *The Craft of Inquiry: Theories, Methods, Evidence*, Oxford University Press. Jeffrey A. Gliner and George A. Morgan (2000), *Research Methods in Applied Settings,* Lawrence Erlbaum Associates, Publishers. David Ford (2000), *Scientific Method for Ecological research*, Cambridge University Press. Thomas S. Kuhn (1962), *The Structure of Scientific Revolutions*, The University of Chicago Press.

Synoptic Table of Class Sessions by Theme

Sessions	***Lectures***	***Interactive Sessions***
I. Scientific Research	Problems	Complexity
	Paradigms	Integration
II. Research Design	Process	Emergence
	Questions	Boundaries & Scales
	Approaches	Values & Perspectives
III. Observations	Sampling, Measurements and Observations	Uncertainty, Unknowns, & Surprises
	System Models	Past, Present, Future
IV. Scientific Inference	Internal Validity, External Validity, & Causality	Confounders, Sensitivity Analyses, & Triangulation
	Interpretation	Synthesis

I. THE LOGIC AND PRACTICE OF SCIENTIFIC RESEARCH

Lecture 1 *Course Overview (09/25)*

Scope of Urban Research Problems: Patterns, Processes, and Change

Robert Alford (1998), *The Craft of Inquiry: Theories, Methods, Evidence*, Chp. 1 The Craft of Inquiry, pp. 1-20.

Interactive 1 *Complexity (09/27)*

Liu, J., T. Dietz, S.R. Carpenter, M. Alberti, C. Folke, E. Moran, A.C. Pell, P. Deadman, T. Kratz, J. Lubchenco, E. Ostrom, Z. Ouyang, W. Provencher, C.L. Redman, S.H. Schneider, W.W. Taylor Complexity of coupled human and natural systems. Science 317:1513-1516

Wuchty S, Jones BF, Uzzi B. The increasing dominance of teams in production of knowledge. Science. 2007; 316: 1036–1039.

* Carpenter, Stephen R., Harold A. Mooney, John Agard, Doris Capistrano, Ruth S. DeFries, Sandra Diaz, Thomas Dietz, Anantha K. Duraiappah, Alfred Oteng- Yeboah, Henrique Miguel Pereira, Charles Perrings, Walter V. Reid, Jose Sarukhan, Robert J. Scholes, and Anne Whyte. 2009. Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. Proceedings of the National Academy of Sciences 106(5): 1305-1312.

Lecture 2 *Paradigm Change in Science*

Thomas S. Kuhn, *Structure of Scientific Revolutions* (1962), The University of Chicago Press, pp.1-210.

Jeffrey A. Gliner and George A. Morgan (2000), *Research Methods in Applied Settings*, Chp. 2: A Tale of Two Paradigms: Quantitative and Qualitative.

* Isadore Newman & Carolyn R. Benz (1998), *Qualitative-Quantitative Research Methodology: Exploring the Interactive Continuum* , Chp. 1: Qualitative – Quantitative Research: A False Dichotomy; Chp. 2: Qualitative and Quantitative Research Methods: An Interactive Continuum.

Interactive 2 *Integration (10/04)*

Bammer, G. 2005. Integration and Implementation Sciences: building a new specialization. Ecology and Society 10(2): 6. [online] URL: http://www.ecologyandsociety.org/vol10/iss2/art6/

Dewey, John. 1920. Reconstruction in philosophy. In The middle works, vol. 12. Jo Ann Boydston, ed. Carbondale, IL: Southern Illinois University Press.

Dewey, John. 1938. Logic: the theory of inquiry. In The later works, vol. 12. Jo Ann Boydston, ed. Carbondale, IL: Southern Illinois University Press.

II RESEARCH DESIGN AS AN EMERGENT PROCESS

Lecture 3 *The Process of Scientific Research*

Robert Alford, (1998), Chp. 2 Designing a Research Project and Chp. 3: "The Construction of Arguments."

Thomas R. Black, *Doing Quantitative Research in the Social Sciences: An Integrated Approach to Research Design, Measurement and Statistics* (1999), Chp. 2: Beginning the Design Process

Interactive 3 *Emergence (10/11)*

Enengel, Barbara; Muhar, Andreas; Penker, Marianne; Freyer, Bernhard; Drlik, Stephanie; and, Ritter, Florian. (2012). Co-production of Knowledge in Transdisciplinary Doctoral Theses on Landscape Development – An Analysis of Actor Roles and Knowledge Types in Different Research Phases. Landscape and Urban Planning, 105, 1-2: 106-117.

Lecture 4 *Framing a Research Questions (10/16)*

Jeffrey A. Gliner and George A. Morgan (2000), Chp. 4: Research Problems, Variables, and Hypotheses.

Arlene Fink(1998), *Conducting Research Literature Reviews.* Chp. 1: Reviewing the Literature, Why? For Whom? How?

Interactive 4 *Boundaries and Scales (10/18)*

Ostrom, E. 2009. A general framework for analyzing sustainability of social–ecological sys- tems. Science 325: 419–422.

David Ford (2000), *Scientific Method for Ecological research*, Chp. 3: Conceptual and Propositional Analysis for Defining Research Problems and Chp. 5 How Theories Develop and How to Use them.

John M. Anderies; Michelle Hegmon. Robustness and resilience across scales: Migration and resource degradation in the prehistoric U.S. Southwest Ecology and Society 2011;16(2):

Lecture 5 *Research Design Approaches (10/23)*

Jeffrey A. Gliner and George A. Morgan (2000), Chp. 5: Overview of Research Approaches and Questions. Chp. 7: Specific Research Design for Randomized Experimental and Quasi-Experimental Design. Chp.14: Single Factor Between Groups Design; *Chp. 15: Single Factors Within Subject Designs; *Chp. 16: Basic Associational design; *Chp. 17: Adding Independent Variables; *Chp. 18: Mixed Factorial Design; *Chp. 19: Interpretation of Complex Associational Analysis and MANOVA.

Thomas R. Black (1999), Chp. 3: Initial Sources of Invalidity and Confounding and Chp. 4: Basic Designs.

Gary King, Robert Keohane, & Sidney Verba (1994), *Designing Social Inquiry: Scientific Inference in Qualitative Research*, Chp. 1: "The Science in Social Science"

*J. Lofland and L.H. Lofland, Analyzing Social Settings: *A Guide to Qualitative Observation and Analysis.*

Interactive 5 *Values and Perspectives (10/25)*

Oct 30-Nov 1 No Class

III OBSERVATIONS AND ANALYSIS

Lecture 6 *Sampling, Measurements, and Observations (11/06)*

David Ford, Scientific Method for Ecological research (2000), Chp. 6 The Art of Measurement and Experiment; Chp. 7: Methods of Reasoning in Research; Chp.:8: Assessment of Postulates.

Jeffrey A. Gliner and George A. Morgan (2000), Chp. 9: Measurement and Descriptive Statistics

*Jeffrey A. Gliner and George A. Morgan (2000), Chp 20: Measurement Reliability and Validity; Chp. 21: Types of Data Collection

Interactive 6 *Uncertainty and Surprise (11/08)*

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D. Thompson, J., Nilsson, M., Lambin, E., Sendzimir, J., Banerjee, B., Galaz, V., van der Leeuw, S. 2011. Tipping Toward Sustainability: Emerging Pathways of Transformation. In AMBIO, Vol. 40, Issue 7. Doi: 10.1007/s13280-011-0186-9

Lecture 7 *System Models (11/13)*

Chapin, S., Carpenter, S., Kofinas, G., Folke, C., Abel, N., Clark, W., et al. (2010). Ecosystem stewardship: sustainability strategies for a rapidly changing planet. Trends in Ecology & Evolution, 25 (4), 241-249.

Badham J. 2008 A Compendium of Modeling Techniques. Integgration Insight. Australian National University.

Interactive 7 *Past Present and Future (11/15)*

Van der Leeuw, S., R. Costanza, S. Aulenbach, S. Brewer, M. Burek, S. Cornell, C. Crumley, J. A. Dearing, C. Downy, L. J. Graumlich, S. Heckbert, M. Hegmon, K. Hibbard, S. T. Jackson, I. Kubiszewski, P. Sinclair, S. Sörlin, and W. Steffen. 2011. Toward an integrated history to guide the future. *Ecology and Society* 16(4): 2.

IV SCIENTIFIC INFERENCE

Lecture 8 *Internal Validity (11/20)*

Jeffrey A. Gliner and George A. Morgan (2000), Chp.6: Internal Validity.

*Judea Pearl (2000) *Causality: Models Reasoning, and Inference*. Chp. 2 A Theory of Inferred Causation.

November 22 Thanksgiving

Lecture 9 *External Validity (11/27)*

Jeffrey A. Gliner and George A. Morgan (2000), Chp. 9: Measurement and Descriptive Statistics; Chp. 10: Sampling and External Validity.

Interactive 8 *Causality (11/29)*

Pearl, J. 2009. Causality: models, reasoning, and inference. 2nd ed.Cambridge University Press, Cambridge.

Lecture 10 *Interpretation (12/05)*

David Ford (2000), *Scientific Method for Ecological research* , Chp. 15: The Methodology of Progressive Synthesis.

Jeffrey A. Gliner and George A. Morgan (2000), Chp. 23: Research Validity and Replication.; Chp. 24: Evaluating Empirical Research Studies: A Synthesis.

Interactive 9 *Synthesis (12/07)*

Bestelmeyer, B. T., A. M. Ellison, W. R. Fraser, K. B. Gorman, S. J. Holbrook, C. M. Laney, M. D. Ohman, D. P. C. Peters, F. C. Pillsbury, A. Rassweiler, R. J. Schmitt, and S. Sharma. 2011. Analysis of abrupt transitions in ecological systems. Ecosphere 2(12):129. doi:10.1890/ES11-00216.1

Interactive 10 *Class Presentations (12/12)*

Final Papers due: December 14 h, 1:00 pm