

**Title:           Methods of Science and Mathematics Education Research**  
**Credits:        2 (~ 22 hours, 1 contact session per week of 2 hours each)**  
**Semester 1:    August 8 to November 30**

**Objectives:**

This research methods course is designed to give doctoral students an introduction to the broad variety of traditions available to the educational researcher. Each of these traditions makes fundamental assumptions about the nature of knowledge, viable research questions and the use of unique methodological tools. Throughout this course we will understand the differences between qualitative and quantitative research methods along with examples of how these can be applied in practice.

**Course goals:**

1. Learn to distinguish between qualitative and quantitative research methods and understand the importance of each methodology
2. Develop skills in analyzing and critiquing research articles that use education research methods.
3. Synthesize findings from prior research in your specific area of interest and identify area which need more work.
4. Utilize some of these methods in designing your own research questions along with a plan to carry out the research and analyze the data.

**Classroom sessions:**

The course will broadly cover the 5 themes below. There will be at least 2 sessions per theme. Each session will focus on one selected chapter/paper which all the participants are expected to read. Based on the reading a short write-up (~ 250 words) has to be submitted by the students, prior to the session which notes down the interesting, important and difficult aspects of the paper. The session will begin with a brief discussion of the summary of the chapter/paper based on the short write-up. This will be followed by in-depth discussion of the salient arguments and features of the chapter/paper. Though the instructor will moderate, the discussion will be lead by all participants in a rotating manner.

## Readings:

### Theme 1: On Becoming an Educational Researcher.

1. Eisenhart, M., & DeHaan, R. (2005). Doctoral preparation of scientifically based educational researchers. *Educational Researcher*, 34(4), 3–13
2. Labaree, D. F. (2003). The peculiar problems of preparing educational researchers. *Educational Researcher*, 32(4), 13-22.

### Theme 2: On Methods, Theory and Explanations in Education Research

1. Howe, K. R. (1992). Getting over the quantitative-qualitative debate. *American Journal of Education*, 100(2), 236-256.
2. Mixed methods research, Chapter 2, *Research Methods in Education*.
3. Theory in educational research, Chapter 4, *Research Methods in Education*.
4. The search for causation, Chapter 6, *Research Methods in Education*.

### Theme 3: Research Design

1. Choosing a research Project, Chapter 9, *Research Methods in Education*.
2. Research questions, Chapter 10, *Research Methods in Education*.
3. Research design and planning, Chapter 11, *Research Methods in Education*.
4. Sampling, Chapter 12, *Research Methods in Education*.
5. Validity and Reliability, Chapter 14, *Research Methods in Education*.

### Theme 4: Methodologies for Educational Research

1. Schoenfield (2006), Design Experiments, In J. L. Green, G. Camilli, & P. B. Moore (Eds.), *Handbook of complementary methods in educational research*. Mahwah, NJ: Lawrence Erlbaum Associates.
2. Cobb, P., Confrey, J., DiSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational researcher*, 32(1), 9-13.
3. Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research?. *Educational researcher*, 41(1), 16-25.
4. Surveys, longitudinal, cross-sectional and trend studies, Chapter 17, *Research Methods in Education*.
5. Bloom and Clarke (2006), Discourse -in-Use, In J. L. Green, G. Camilli, & P. B. Moore (Eds.), *Handbook of complementary methods in educational research*. Mahwah, NJ: Lawrence Erlbaum Associates.
6. Case Study, Chapter 19, *Research Methods in Education*.

## **Theme 5: Methods of Data Collection and Analysis**

1. Questionnaires, Chapter 24, Research Methods in Education.
2. Interviews, Chapter 25, Research Methods in Education.
3. Russ, R. S., Lee, V. R., & Sherin, B. L. (2012). Framing in cognitive clinical interviews about intuitive science knowledge: Dynamic student understandings of the discourse interaction. *Science Education*, 96(4), 573-599.
4. Approaches to qualitative data analysis, Chapter 32, Research Methods in Education.
5. Organizing and presenting qualitative data, Chapter 33, Research Methods in Education.
6. Coding and content analysis, Chapter 34, Research Methods in Education.
7. Grounded Theory, Chapter 37, Research Methods in Education.

## **Course materials:**

1. Research Methods in Education (1994). 8TH Edition, Cohen, L., and Manion, L. (Eds.)  
Routledge
2. Handbook of complementary methods in education research (2006). Green, J.L., Camilli, G., and Elmore, P.B. (Eds). Published for AERA by Lawrence Earlbaum Assoc.
3. Selected papers and other readings as disseminated throughout the course.