

**George Mason University**  
**College of Education and Human Development**  
**Mathematics Education Leadership**

EDCI858 (01)– Mathematics Education Research Design and Evaluation  
3 Credits, Fall 2017  
Tuesdays, 4:30-7:10, Robinson Hall B218

Instructor: Margret Hjalmarson  
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Office hours: By appointment  
Prerequisites/Corequisites: None

**University Catalog Course Description**

Students review methods of research appropriate for mathematics education settings and develop theoretical framework and action plan for conducting research project. Notes: Yearlong seminar for PhD students in the mathematics education leadership cohort program. Offered by Graduate School of Education. May not be repeated for credit.

*Students must use their MasonLive email account to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.*

*All course materials will be posted on Blackboard.*

**Course Description:** Students review methods of research appropriate for mathematics education settings and develop theoretical framework and action plan for conducting research project.

**Learner Objectives**

1. Explore the scope of mathematics education research methods and their evolution over time.
2. Develop an understanding of the design of mathematics education research at a variety of scales (e.g., qualitative, quantitative)
3. Examine the development of a research agenda over time and the conceptual development of mathematics education research.

**Required Readings**

All readings will be posted on Blackboard.

Bannan-Ritland, B. (2003). The role of design in research: The integrative learning design framework. *Educational Researcher*, 32(1), 21–24.  
<https://doi.org/10.3102/0013189X032001021>

- Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9–13.  
<https://doi.org/10.3102/0013189X032001009>
- Confrey, J., & Kazak, S. (2006). A thirty-year reflection on constructivism in mathematics education in PME. In A. Gutierrez & P. Boero (Eds.), *Handbook of research on the psychology of mathematics education* (pp. 305–345). Rotterdam, The Netherlands: Sense Publishers.
- Eisenhart, M. A. (1988). The ethnographic research tradition and mathematics education research. *Journal for Research in Mathematics Education*, 19(2), 99–114.
- Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelley-Petersen, M. (2009). Conceptualizing the work of leading mathematical tasks in professional development. *Journal of Teacher Education*, 60(4), 364–379.  
<https://doi.org/10.1177/0022487109341150>
- Gainsburg, J. (2007). The mathematical disposition of structural engineers. *Journal for Research in Mathematics Education*, 38(5), 477–506.
- Hall, R. (2000). Video recording as theory. In E. Kelly & R. A. Lesh (Eds.), *Handbook of research on science and mathematics education* (pp. 647–664). Mahwah, NJ: Lawrence Erlbaum.
- Herbel-Eisenmann, B. A., & Otten, S. (2011). Mapping mathematics in classroom discourse. *Journal for Research in Mathematics Education*, 42(5). Retrieved from <http://search.proquest.com.mutex.gmu.edu/docview/905712144/1402B1AEF6A7557A948/3?accountid=14541>
- Hiebert, J., Gallimore, R., Bogard Givvin, K., Hollingsworth, H., Miu-Ying Chui, A., Wearne, D., ... Stigler, J. (2003). *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Study* (No. NCES 2003–013 Revised). Washington D.C.: U.S. Department of Education, National Center for Education Statistics.
- Hiebert, J., & Stigler, J. W. (2000). A proposal for improving classroom teaching: Lessons from the timss video study. *The Elementary School Journal*, 101(1), 3–20.
- Hjalmarson, M. A., & Lesh, R. (2008). Design research: Engineering, systems, products and processes for innovation. In L. English (Ed.), *Handbook of international research in mathematics education* (2nd ed., pp. 520–534). New York: Routledge.
- Larnell, G. V. (2016). More than just skill: Examining mathematics identities, racialized narratives, and remediation among black undergraduates. *Journal for Research in Mathematics Education*, 47(3), 233–269.  
<https://doi.org/10.5951/jresmetheduc.47.3.0233>
- Lesh, R., & Clarke, D. (2000). Formulating operational definitions of desired outcomes of instruction in mathematics and science education. In A. Kelly & R. A. Lesh (Eds.), *Handbook of Research Design in Mathematics and Science Education* (p. 113–149). Mahwah, NJ: Lawrence Erlbaum.
- Lewis, C., & Perry, R. R. (2017). Lesson study to scale up research-based knowledge: A randomized, controlled trial of fractions learning. *Journal for Research in Mathematics Education*, 48(3), 261–299.
- McGraw, R., Lubienski, S. T., & Strutchens, M. E. (2006). A closer look at gender in NAEP mathematics achievement and affect data: Intersections with achievement, race/ethnicity, and socioeconomic status. *Journal for Research in Mathematics Education*, 3(1), 129–150.

- Rasmussen, C., & Stephan, M. (2008). A methodology for documenting collective activity. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research in education: Innovations in science, technology, engineering and mathematics learning and teaching* (pp. 195–215). Mahwah, N.J.: Taylor and Francis.
- Schoenfeld, A. H. (2008). Research methods in (mathematics) education. In L. D. English, M. Bartolini Bussi, G. A. Jones, R. A. Lesh, B. Sriraman, & D. Tirosh (Eds.), *Handbook of international research in mathematics education* (2nd ed., pp. 467–519). New York, NY: Taylor and Francis.
- Shih, J. C., Ing, M., & Tarr, J. E. (2015). Addressing measurement issues in two large-scale mathematics classroom observation protocols. In J. A. Middleton, J. Cai, & S. Hwang (Eds.), *Large-Scale Studies in Mathematics Education* (pp. 363–371). Springer, Cham. [https://doi.org/10.1007/978-3-319-07716-1\\_16](https://doi.org/10.1007/978-3-319-07716-1_16)
- Simon, M. A. (2000). Research on the development of teachers: The teacher development experiment. In A. E. Kelly & R. A. Lesh (Eds.), *Handbook of Research Design in Mathematics and Science Education* (pp. 335–360). Mahwah, N.J.: Erlbaum.
- Star, J. R. (2005). Reconceptualizing procedural knowledge. *Journal for Research in Mathematics Education*, 36, 404–411.
- Steffe, L. P. (2013). Establishing mathematics education as an academic field: A constructive odyssey. *Journal for Research in Mathematics Education*, 44(2), 354–371. <https://doi.org/10.5951/jresmetheduc.44.2.0353>
- Steffe, L. P., & Thompson, P. W. (2000). Teaching experiment methodology: Underlying principles and essential elements. In A. E. Kelly & R. A. Lesh (Eds.), *Handbook of Research Design in Mathematics and Science Education* (pp. 267–306). Mahwah, N.J.: Erlbaum.
- Wood, T., Cobb, P., & Yackel, E. (1991). Change in teaching mathematics: A case study. *American Educational Research Journal*, 28(3), 587–616. <https://doi.org/10.2307/1163150>

### **Attendance Policy**

"Students are expected to attend the class periods of the courses for which they are registered. ***In-class participation is important not only to the individual student, but also to the class as a whole.*** Because class participation may be a factor in grading, instructors may use absence, tardiness, or early departure as de facto evidence of nonparticipation. Students who miss an exam with an acceptable excuse may be penalized according to the individual instructor's grading policy, as stated in the course syllabus." (George Mason University Catalog 2017-2018, AP.1.6 Attendance Policies)

All students are expected to arrive on time and participate in class in a scholarly fashion including have prepared by reading course materials and being prepared to engage in discussion of such materials. 10% of the final grade in the course depends on satisfactory participation in class.

### **Course Assignments**

Detailed instructions and rubrics for all assignments will be posted to the Blackboard site for the course at <http://mymason.gmu.edu>. Please refer to these documents when completing your work.

All written assignments should be submitted using APA 6<sup>th</sup> Edition for formatting.

All assignments should be submitted in Blackboard by 9:00 pm on the due date for the assignment. Extensions may be provided at the instructor's discretion only with permission provided by email *prior* to the deadline. Assignments submitted after the deadline will be subject to a 10% reduction in grade for the assignment.

### **A. Research Methodology Synthesis (50%)**

From your readings in the field of mathematics education, select a particular area of interest. In this assignment, the final paper will focus on summarizing the research from a methodological perspective by examining how different methods were used in different studies on a related topic. Formulate a question or problem of interest to design a research project. This assignment will occur in two major phases: (1) peer discussion and feedback about topic and questions and (2) writing a synthesis paper

### **B. Pick-a-Researcher Biography (40%)**

In this project students will select a significant researcher in mathematics education, seek out their articles and papers, and summarize their work from a historical perspective. What were the origins of their work? What were early topics they began investigating? What are major projects or themes they have pursued? What methodologies have they used to conduct their work? How has their work evolved over time? Finally, what can you as a mathematics education researcher and leader take away from their work? What have you learned about the nature of mathematics education research?

### **C. Class Participation & Reading Analysis (10%)**

Participation and engagement is an important part of engaging in a scholarly community such as mathematics education research. Hence, participation and timely attendance in class is a critical part of development as a researcher in mathematics education. Consistent lack of participation (including late arrival or inconsistent attendance) will result in deductions from the participation grade. Some absences are unavoidable and should be communicated to the instructor in advance if possible.

### Grading

Grades will be assigned as follows.

90-100% = A, 80% - 89% = B, 70% - 79% = C, 60% - 69% = D, Less than 60% = F

### **Professional Dispositions**

See <https://cehd.gmu.edu/students/polices-procedures/>

### **Core Values Commitment**

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

### Schedule

Note that the schedule may be adjusted at the discretion of the instructor. Changes will be announced on the course site in Blackboard.

Date	Readings	Assignments Due
8/29/17	<i>None</i>	
9/5/17	Landscape of research- (Schoenfeld, 2008; Steffe, 2013) & <i>Common Guidelines for Education Research</i>	
9/12/17	Studies of Learning - (Confrey & Kazak, 2006; Lesh & Clarke, 2000; Star, 2005)	
9/19/17	Quantitative research - Sloane, in press;	
9/26/17	Teaching Experiments - (Simon, 2000; Steffe & Thompson, 2000)	Research Synthesis – Topic Summary Due
10/3/17	Analyzing Interactions - (Hall, 2000; Herbel-Eisenmann & Otten, 2011; Rasmussen & Stephan, 2008)	
10/10/17	<i>No Class - October break</i>	
10/17/17	<i>Researcher Biography Presentations</i>	Researcher Biography Paper
10/24/17	Case Study (Elliott et al., 2009; Larnell, 2016; Wood, Cobb, & Yackel, 1991)	Research Synthesis – Reference List Due
10/31/17	Observation (Eisenhart, 1988; Gainsburg, 2007; Shih, Ing, & Tarr, 2015)	
11/7/17	Design Research - (Bannan-Ritland, 2003; Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; Hjalmarson & Lesh, 2008)	
11/14/17	Large scale studies - (Lewis & Perry, 2017; McGraw, Lubienski, & Strutchens, 2006)	Research Synthesis – Draft Paper Due
11/21/17	International Comparisons - (Hiebert et al., 2003; Hiebert & Stigler, 2000)	
11/28/17	<i>Thanksgiving – online assignment</i>	
12/5/17	TBD	Research synthesis - Final paper due

## George Mason University Policies and Resources for Students

### *Policies*

- Students must adhere to the guidelines of the Mason Honor Code (see <http://oai.gmu.edu/the-mason-honor-code/>).
- Students must follow the university policy for Responsible Use of Computing (see <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

### *Campus Resources*

- Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.gmu.edu/>.
- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

**For additional information on the College of Education and Human Development, please visit our website <https://cehd.gmu.edu/students/>.**