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

EDCI 858 DL1 – Mathematics Education Research Design and Evaluation
3 Credits, Fall 2020
Wednesdays, 4:30-7:10; Synchronous Online

Faculty

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COVID 19 Procedures Fall 2020

Students, please be aware of and follow all policies and procedures for Mason's Safe Return to Campus: https://www2.gmu.edu/Safe-Return-Campus

Prerequisites/Corequisites
Admission to the Mathematics Education Leadership PhD program.

University Catalog Course Description
Examines methods of research appropriate for mathematics education. Develops knowledge of the scope and evolution of research methodologies from a range of perspectives. Offered by Graduate School of Education. May not be repeated for credit.

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

Course Delivery Method
This course will be delivered online (76% or more) using synchronous format via Blackboard Learning Management system (LMS) housed in the MyMason portal. You will log in to the Blackboard (Bb) course site using your Mason email name (everything before @masonlive.gmu.edu) and email password. The course site will be available on August 17, 2020.

Under no circumstances, may candidates/students participate in online class sessions (either by phone or Internet) while operating motor vehicles. Further, as expected in a face-to-face class meeting, such online participation requires undivided attention to course content and communication.

Technical Requirements

To participate in this course, students will need to satisfy the following technical requirements:

- High-speed Internet access with standard up-to-date browsers. To get a list of Blackboard's supported browsers see: https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#supported-browsers

  To get a list of supported operation systems on different devices see: https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#tested-devices-and-operating-systems
- Students must maintain consistent and reliable access to their GMU email and Blackboard, as these are the official methods of communication for this course.
- Students will need a headset microphone for use with the Blackboard Collaborate web conferencing tool.
- Students may be asked to create logins and passwords on supplemental websites and/or to download trial software to their computer or tablet as part of course requirements.
- The following software plug-ins for PCs and Macs, respectively, are available for free download:
  - Adobe Acrobat Reader: https://get.adobe.com/reader/
  - Windows Media Player: https://support.microsoft.com/en-us/help/14209/get-windows-media-player
  - Apple Quick Time Player: www.apple.com/quicktime/download/

Expectations

- Course Week:
  Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes.
- Log-in Frequency:
  Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials at least 2 times per week. In addition, students must log-in for all scheduled online synchronous meetings.
- Participation:
  Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.
- Technical Competence:
  Students are expected to demonstrate competence in the use of all course technology. Students who are struggling with technical components of the course are expected to seek assistance from the instructor and/or College or University technical services.
- Technical Issues:

Students should anticipate some technical difficulties during the semester and should, therefore, budget their time accordingly. Late work will not be accepted based on individual technical issues.

- Workload:
  Please be aware that this course is **not** self-paced. Students are expected to meet *specific deadlines* and *due dates* listed in the **Class Schedule** section of this syllabus. It is the student's responsibility to keep track of the weekly course schedule of topics, readings, activities and assignments due.
- Instructor Support:
  Students may schedule a one-on-one meeting to discuss course requirements, content or other course-related issues. Those unable to come to a Mason campus can meet with the instructor via telephone or web conference. Students should email the instructor to schedule a one-on-one session, including their preferred meeting method and suggested dates/times.
- Netiquette:
  The course environment is a collaborative space. Experience shows that even an innocent remark typed in the online environment can be misconstrued. Students must always re-read their responses carefully before posting them, so as others do not consider them as personal offenses. *Be positive in your approach with others and diplomatic in selecting your words*. Remember that you are not competing with classmates, but sharing information and learning from others. All faculty are similarly expected to be respectful in all communications.
- Accommodations:
  Online learners who require effective accommodations to insure accessibility must be registered with George Mason University Disability Services.

Learner Outcomes or Objectives

This course is designed to enable students to do the following:

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 Texts

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

Common guidelines for education research and development: A report from the Institute of Education Sciences, U. S. Department of Education and the National Science Foundation. (2013). Washington D.C. Retrieved from https://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf

Confrey, J. (2017). Research: To inform, deform or reform. In. J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 3-27). National Council of Teachers of Mathematics.

D'Ambrosio, B., Martin, D. B., Frankenstein, M., Moschkovich, J., Gutierrez, R., Taylor, E., Kastberg, S., & Barnes, D. (2013). Positioning oneself in mathematics education research: JRME equity special issue editorial panel. *Journal for Research in Mathematics Education*, *44*(1), 11-22.

Davis, J. (2019). Using critical race theory as a pedagogical, theoretical, methodological, and analytical tool in mathematics education for Black students in urban areas. In J. Davis & C. C. Jett (Eds.), *Critical race theory in mathematics education* (pp. 183-205). Routledge.

de Freitas, E., Lerman, S., & Parks, A. N. (2017). Qualitative methods. In J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 159-182). National Council of Teachers of Mathematics.

Eisenhart, M. A. (1988). The ethnographic research tradition and mathematics education research. *Journal for Research in Mathematics Education*, *19*(2), 99–114.

Frank, T. J. (2019). Using critical race theory to unpack the Black mathematics teacher pipeline. In J. Davis & C. C. Jett (Eds.), *Critical race theory in mathematics education* (pp. 98-122). Routledge.

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.

Jett, C. C. (2019). Mathematical persistence among four African American male graduate students: A critical race analysis of their experiences. *Journal for Research in Mathematics Education*, *50*(3), 311-340.

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/jresematheduc.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.

Martin, D. B. (2013). Race, racial projects, and mathematics education. *Journal for Research in Mathematics Education*, *44*(1), 316-333.

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.

Powell, A. B., Francisco, J. M, & Maher, C. (2003). An analytical model for studying the development of learners' mathematical ideas and reasoning using videotape data. *The Journal of Mathematical Behavior*, 22(4), 405-435. https://doi.org/10.1016/j.jmathb.2003.09.002

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

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.

Sloane, F. C. & Wilkins, J. L. M. (2017). Aligning statistical modeling with theories of learning in mathematics education. In. J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 183-207). National Council of Teachers of Mathematics.

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/jresematheduc.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.

White, D. Y. (2003). Promoting productive mathematical classroom discourse with diverse students. *The Journal of Mathematical Behavior, 22(1), 37-53.* https://doi.org/10.1016/S0732-3123(03)00003-8

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

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, Tk20, hard copy). 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 7th Edition for formatting.

All assignments should be submitted in Blackboard by 11:59 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.

- **Assignments and/or Examinations**
  All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues. **Additional details and rubrics for all assignments will be posted on Blackboard.**

A. 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.

The expectations, demands, and workload of this course are professional and high. Class discussions require a commitment to reading reflectively and critically the assigned readings. **Students are expected to post 3-5 questions grounded in the readings for class discussion by 11:59 p.m. the Sunday before class.** These questions should be posted on the Blackboard Discussion Board.

B. **CURRENT TRENDS IN MATHEMATICS EDUCATION ARTICLE PRESENTATION (20%)**

This assignment is designed to encourage reading and discussion about current trends in mathematics education research in order to become familiar with new directions in mathematics education. Reading current publications and staying up-to-date with current trends is a critical aspect of mathematics research and leadership. For this assignment, select an article published in 2019-2020 about mathematics education in a peer-reviewed research journal (e.g., *Journal for Research in Mathematics Education, Mathematics Thinking and Learning, Educational Studies in Mathematics, Educational Researcher*). A Blackboard discussion board will be available for posting the articles electronically. You must make a copy of the article available for class access the class session prior to your discussion leading. Each person will lead a 30-minute discussion of the article in class.

C. PICK-A-RESEARCHER BIOGRPAHY (20%)

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?

D. 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.

- **Other Requirements**

All assignments require APA (7th edition) formatting:

American Psychological Association (2020). *Publication manual of the American psychological association*. Washington, DC.

- **Grading Policy (Graduate Special Grading Scale)**

A 90%-100%	C 70%-79%	F Below 60%
B 80%-89%	D.60%-69%	

Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times. Education professionals are held to high standards, both inside and outside of the classroom. Educators are evaluated on their behaviors and interactions with students, parents, other professionals, and the community at large. At the College of Education and Human Development, dispositions may play a part in the discussions and assignments of any/all courses in a student's program (and thus, as part or all of the grade for those assignments). For additional information visit: https://cehd.gmu.edu/students/polices-procedures/

Class Schedule

Date	Topic(s)	Readings Due	Assignments Due
Class 1 August 26 **Format** Synchronous	**Designing & Evaluating Research**	No Assigned Readings Due	Profile picture and information posted in Collaborate.
Class 2 September 2 **Format** Synchronous	**Landscape of Research** **Library Consultation**	Shoenfeld (2008) Steffe (2013)	**Researcher Biography** 1. Read Assignment 2. Brainstorm Possible Researchers (2-3)
Class 3 September 9 **Format** Synchronous	**Reforming Math Education Research** **Evaluation Criteria**	Confrey (2017) Martin (2013) D'Ambrosio et al. (2013)	
Class 4 September 16 **Format** Synchronous	**Quantitative Research** ***Current Trend Presentation #1***	Sloane & Wilkins (2017)	**Research Synthesis** Topic Summary Due
Class 5 September 23 **Format** Synchronous	**Qualitative Research** ***Current Trend Presentation #2***	de Freitas et al. (2017)	
Class 6 September 30 **Format** Synchronous	**Teaching Experiments** ***Current Trend Presentation #3***	Simon (2000) Steffe & Thompson (2000)	

Class 7 October 7 **Format** Synchronous	**Analyzing Interactions** ***Current Trend Presentation #4***	Herbel-Eisenmann & Otten (2011) Powell et al. (2003) Rasmussen & Stephan, (2008)	**Researcher Biography** Paper Due
Class 8 October 14 **Format** Asynchronous	**Researcher Biography Peer Feedback** **Research Synthesis Workshop**	No Assigned Readings Due	
Class 9 October 21 **Format** Synchronous	**Critical Race Theory** ***Current Trend Presentation #5***	Davis (2019) Frank (2019)	**Research Synthesis** Reference List Due
Class 10 October 28 **Format** Synchronous	**Case Study** ***Current Trend Presentation #6***	Larnell (2016) Jett (2019) Wood et al. (1991)	
Class 11 November 4 **Format** Synchronous	**Observation** ***Current Trend Presentation #7***	Eisenhart (1988) Shih et al. (2015) White (2003)	
Class 12 November 11 **Format** Synchronous	**Design Research** ***Current Trend Presentation #8***	Bannan-Ritland (200) Cobb et al. (2003) Hjalmarson & Lesh (2008)	**Research Synthesis** Final Draft Due
Class 13 November 18 **Format** Synchronous	**Large Scale Studies** ***Current Trend Presentation #9***	Lewis & Perry (2017) McGraw et al. (2006)	
November 18 **NO CLASS**	**THANKSGIVING BREAK**		
Class 14 December 2 **Format** Synchronous	**International Comparisons**	Hiebert et al. (2003) Hiebert & Stigler (2000)	
Class 15 December 9 **Format** Synchronous	**Sharing Our Research Syntheses**		**Research Synthesis** Final Paper Due

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

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/.

GMU Policies and Resources for Students

Policies

- Students must adhere to the guidelines of the Mason Honor Code (see https://catalog.gmu.edu/policies/honor-code-system/).
- Students must follow the university policy for Responsible Use of Computing (see https://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 https://ds.gmu.edu/).
- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or https://cehd.gmu.edu/aero/tk20. Questions or concerns regarding use of Blackboard should be directed to https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/.
- For information on student support resources on campus, see https://ctfe.gmu.edu/teaching/student-support-resources-on-campus

Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking:
As a faculty member, I am designated as a "Responsible Employee," and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek

assistance from Mason's Title IX Coordinator by calling 703-993-8730, or emailing titleix@gmu.edu.

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