

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

EDUC 896- Current Issues in Mathematics and STEM Education Research
Fall 2017 - 3 credits
Thursday 4:30-7:10pm
Thompson 2010

Faculty Information

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Prerequisites/Corequisites

Students enrolled in the course must be enrolled in the Mathematics Education Leadership doctoral program.

University Catalog Course Description

This introduces contemporary topics in mathematics education research. Students learn about current issues in research design and topics of interest in mathematics teaching, learning, policy and practice. They apply this knowledge to develop pilot studies.

Course Overview

This course was designed with three primary goals: (1) to introduce MEL students to contemporary issues in mathematics and STEM education; (2) to support students in critically reading research in mathematics and STEM education; and (3) to develop skills related to writing literature reviews and designing research.

Course Delivery Method

This course will be delivered using a weekly seminar format.

Learner Outcomes or Objectives

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

- Analyze and critique contemporary mathematics education research
- Understand major theories in contemporary mathematics education research
- Examine current issues and topics in mathematics education, teaching, learning, and school-based reform

- Demonstrate the ability to search the literature and to craft a literature review pertinent to their research interests that integrates seminal and contemporary literature in mathematics education
- Develop the research design for a pilot study informed by the literature review
- Develop and reinforce critical thinking, oral, and writing skills
- Write clearly and coherently
- Use APA style of writing

Professional Standards

N/A

Required Texts

**Spangler, D. A. & Wanko, J.J (2017). *Enhancing Classroom Practice with Research behind Principles to Actions*. Reston VA: NCTM

Ebook discount with NCTM membership

<https://www.nctm.org/Store/Products/Enhancing-Classroom-Practice-with-Research-behind-Principles-to-Actions/>

American Psychological Association. (2009). *Publication manual of the American Psychological Association* (6th ed). Washington, DC: Author.

Bartell, T. G., Bieda, K. N., Putnam, R. T., Bradfield, K., & Dominguez, H. (Eds.). (2015). *Proceedings of the 37th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. East Lansing, MI: Michigan State University. Retrieved from <http://www.pmena.org/pmenaproceedings/PMENA%2037%202015%20Proceedings.pdf>

Wood, M.B., Turner, E. E., Civil, M., & Eli, J. A. (Eds.). (2016). *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Tucson, AZ: The University of Arizona. <http://www.pmena.org/pmenaproceedings/PMENA%2038%202016%20Proceedings.pdf>

Observing for Access, Power, and Participation in Mathematics Classrooms as a Strategy to Improve Mathematics Teaching and Learning

Aguirre, Julia M., Erin E. Turner, Tonya Gau Bartell, Crystal Kalinec-Craig, Mary Q. Foote, Amy Roth McDuffie, and Corey Drake. "Making connections in practice: How prospective elementary teachers connect to children's mathematical thinking and community funds of knowledge in mathematics instruction." *Journal of Teacher Education* 64, no. 2 (2013): 178-192.

Bartell, Tonya, Anita Wager, A. Edwards, D. Battey, M. Foote, and J. Spencer. "Toward a Framework for Research Linking Equitable Teaching with the Standards for

Mathematical Practice.” *Journal for Research in Mathematics Education* 48, no. 1 (2017): 7–21.

Lawrenz, F., Gravemeiher, K., & Stephan, M., (2017). STEM for the Future and the Future of STEM, *International Journal of Science and Mathematics Education* 15 (1), selected readings.

Additional articles selected by the instructor and students

STEM integration and Priorities

http://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/J_-Michael-Shaughnessy/STEM_-An-Advocacy-Position,-Not-a-Content-Area/

<https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Matt-Larson/Math-Education-Is-STEM-Education!/>

Current Issues for STEM TEACHER LEADERSHIP

<https://www.nap.edu/catalog/18984/exploring-opportunities-for-stem-teacher-leadership-summary-of-a-convocation>

<https://www.nap.edu/catalog/18612/stem-integration-in-k-12-education-status-prospects-and-an>

<https://www.ed.gov/stem>

[Computational Thinking](https://www.csteachers.org/page/CompThinking) <https://www.csteachers.org/page/CompThinking>

C. Connecting Informal and Formal STEM experiences

<http://www.stemedcoalition.org/wp-content/uploads/2016/04/The-Case-for-Informal-STEM-Education-Final-April-2016.pdf>

Web Resources

Critical Issues in Mathematics Education (an MSRI Workshop Series)

<https://www.msri.org/web/msri/education/for-k-12-educators/critical-issues>

Purdue Owl Writing Lab (Support for APA formatting)

<https://owl.english.purdue.edu/owl/resource/560/01/>

<http://www.nctm.org/uploadedFiles/About/MathEdInUS2016.pdf>

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).

Assignments and Examinations

A. *Current Issues in Mathematics and STEM Education Research Topic Search (30 points)*

Part 1: The Synthesis Paper (20 points)

You will review the top journals and two most recent volumes of PME and PME-NA conference proceedings for topics related to your research interest(s). Provide a summary and critique for approximately 5-7 papers. The critique should include the following parts: purpose, methods, results and critical comments as well as reflections about the article.

Part 2: Lead a Research Expertise Presentation (10 points)

You will give a (10 minute) oral presentation using a PowerPoint related to the current issues you explored that highlights the seminal, historic, and current research that informs your research topic of choice.

B. *Application of Research Knowledge Assignment (40 points)*

You will create a pilot study to address a research question informed by your topic of interest and methodological choices that are best suited for your study. Sections of the paper will include: PART 1: (1) Statement of the Problem; (2) Purpose of the Study; (3) Significance of the Study; PART 2: (4) Review of Literature; (5) Questions and/or Hypotheses; PART 3: (6) Design: Methods and Procedures; (7) Sample; (8) Measures; and (9) Data Collection. (10) Preliminary Analysis

[https://docs.google.com/document/d/19E-](https://docs.google.com/document/d/19E-BSNRkydcZ5MlmodBGDLIYtFemXjAqPH1O9gzvfpo/edit?usp=sharing)

[BSNRkydcZ5MlmodBGDLIYtFemXjAqPH1O9gzvfpo/edit?usp=sharing](https://docs.google.com/document/d/19E-BSNRkydcZ5MlmodBGDLIYtFemXjAqPH1O9gzvfpo/edit?usp=sharing)

C. *Analytic Memos/Meetings for Research Project (20points)*

You will choose a pilot research project to work on either as a group or an individual. Each week, you will write an analytic memo related to your project and meet with a small group to share your progress.

[http://scimath.unl.edu/MIM/coursematerials/files/TEAC888/E%20Project%20handouts/AnalMe](http://scimath.unl.edu/MIM/coursematerials/files/TEAC888/E%20Project%20handouts/AnalMemoInstr_2010.pdf)
[moInstr_2010.pdf](http://scimath.unl.edu/MIM/coursematerials/files/TEAC888/E%20Project%20handouts/AnalMemoInstr_2010.pdf)

[https://docs.google.com/document/d/1y_pzyBk_-SAtmIpUxueEFyC3WU2UwIFSv-](https://docs.google.com/document/d/1y_pzyBk_-SAtmIpUxueEFyC3WU2UwIFSv-fdOxv9IEw/edit?usp=sharing)
[fdOxv9IEw/edit?usp=sharing](https://docs.google.com/document/d/1y_pzyBk_-SAtmIpUxueEFyC3WU2UwIFSv-fdOxv9IEw/edit?usp=sharing)

D. *Weekly Reading Reflection (10points)*

Each of you will on the readings and it's connection to your research interest and/or a methodology that is relevant to your work. Reflection should include at least 3 big ideas, 2 questions, 1 connection to your research that you want to bring up in class discussions.

https://docs.google.com/document/d/18_Ie6iqDIQFi2JPtpJeuQUPK_zDeWEdYnRQ4twFjiOI/edit?usp=sharing

Other Requirements

Students are expected to attend class regularly and fully participate.

Course Performance Evaluation Weighting

Current Issues in Mathematics and STEM Education Research Topic Search	30
Application of Research Knowledge Assignment	40
Research Analytic Memos (Google doc)	20
Class Participation (includes weekly reading reflection) 3 big ideas, 2 questions, 1 connection to your research	10
TOTAL	100 pts

Grading Policy

A+	98-100%	A	93-97.49%	A-	90-92.49%
B+	88-89.49%	B	83-87.49%	B-	80-82.49%
C	70-79.49%	F	below 70%		

Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times.

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 <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

- 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 <http://coursessupport.gmu.edu/>.
- The George Mason University Writing Center staff provides a variety of resources
- and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing (see <http://writingcenter.gmu.edu/>).
- The George Mason University Counseling and Psychological Services (CAPS)
- staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance (see <http://caps.gmu.edu/>).
- The George Mason University Office of Student Support staff helps students negotiate life situations by connecting them with appropriate campus and off-campus resources. Students in need of these services may contact the office by phone (703-993-5376). Concerned students, faculty and staff may also make a referral to express concern for the safety or well-being of a Mason student or the community by going to <http://studentsupport.gmu.edu/>, and the OSS staff will follow up with the student.

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

Class Schedule

Faculty reserves the right to alter the schedule as necessary, with notification to students. Smaller assignments may be assigned to help you work toward completion of the major projects in the course.

Date	Topic Readings	Assignment Due
8/31 Week 1	Introduction & Course Overview	Bring an artifact that represents a current issue in Math and STEM education that you are interested in sharing
9/7 Week 2	Current Issues Reading: Research and Advocacy Readings from Critical Issues I: Access, Power, and Participation in Mathematics Classrooms Aguirre et al. (2013) Bartell et al. (2017)	Update Vitae
9/14 Week 3 Asynchronous Session	BB discussion activity Readings from Critical Issues I: Access, Power, and Participation in Mathematics Classrooms MSRI video analysis	Portfolio Link
9/21 Week 4	Overview – Pilot Studies Readings from Critical Issues I: Access, Power, and Participation in Mathematics Classrooms Case study from White, Crespo and Civit (2017)	Current Issues Topic selection due
9/28 Week 5	Writing a Statement of the Problem Defining the Purpose and Significance of the Study Readings from Critical Issues II: STEM education Lawrenz, F., Gravemeiher, K., & Stephan, M., (2017). STEM for the Future and the Future of STEM, International Journal of Science and Mathematics Education 15 (1), Selected articles.	In 1-2 pages, share your research interests and the topic you plan to use for your literature review.
10/5 Week 6	Literature Reviews: Searching, Surveying, and Organizing Readings from Critical Issues II: STEM education STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research (2014)	Submit an outline of your literature review and/or a draft

10/12 Week 7	Literature Reviews: Synthesis of Research Findings Readings from Critical Issues II: STEM education Exploring Opportunities for STEM Teacher Leadership ; (2014) The-Case-for-Informal-STEM-Education	Submit a draft of your problem statement, purpose and significance of your Study
10/19 Week 8	Crafting Research Questions and/or Hypotheses Readings from Critical Issues III: Improving Teaching Enhancing-Classroom-Practice-with-Research-behind-Principles-to-Actions/ (Ch 1-3)	Submit a memo that presents you research question(s) and/or hypotheses related to your research topic.
10/26 Week 9	Research Design: Selecting Appropriate Methodological Approaches Readings from Critical Issues III: Improving Teaching Enhancing-Classroom-Practice-with-Research-behind-Principles-to-Actions/ (Ch 4-6)	<i>Current Issues in Mathematics and STEM Education Research Topic Search (30 points) Part 1: The Synthesis Paper (20 points)</i>
11/2 Week 10	Research Design: Sampling Procedures Readings from Critical Issues III: Improving Teaching Enhancing-Classroom-Practice-with-Research-behind-Principles-to-Actions/ (Ch 7-9)	
11/9 Week 11	Research Design: Identifying Measures Readings from Critical Issues III: Improving Teaching Enhancing-Classroom-Practice-with-Research-behind-Principles-to-Actions/ (Ch 10-13)	Research Expertise Presentations Due Researcher (10 points)
11/16 Week 12	Research Design: Data Collection Readings from Peer's research collection	Submit a memo that discusses possible sampling procedures, measures you want to include in your pilot study, and procedures for data collection.
11/23 Week 13	THANKSGIVING BREAK ☺	
11/30 Week 14	Limitations, future directions for research, and education implications Readings from Peer's research collection	

12/7 Week 15	Presenting your Research Readings from Peer's research collection	Application of Research Knowledge Assignment
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