George Mason University
College of Education and Human Development
Graduate School of Education
PhD in Education (Mathematics Education Leadership Concentration)

EDCI 855 (001): Mathematics Education Research on Teaching and Learning
Spring 2014

Professor:
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Office hours: By appointment
Office: Thompson Hall 2201 (Mailbox in suite 2500)

Meeting Times: Wednesdays, 4:30-7:10
Location: East 134
University Catalog Course Description: (3 credit hours) Yearlong seminar; students survey most current research literature in mathematics education and engage in research, study, and discussion on teaching and learning in school settings.
Prerequisites/Co-requisites: Admission to mathematics education leadership PhD program.

Required Textbooks:

Carpenter, T. P., Dossey, J. A., & Koehler, J. L. (2004). *Classics in mathematics education research*. Reston, VA: National Council of Teachers of Mathematics.
Lester, F. (2008). *Second handbook of research on mathematics teaching and learning.* Charlotte, NC: Information Age Publishing.

Student Outcomes

At the conclusion of the course students should be able to:
1. Analyze and reflect on mathematics education research about student learning.
2. Understand major theoretical positions in mathematics education.
3. Explain the development of theories of mathematics education.
4. Begin to conduct mathematics education research.

Relationship to Program Goals and Professional Organization

EDCI 855 is designed to enable mathematics education leaders to understand learning and teaching in mathematics as introduction to foundational theories and research in the field. The course was developed according to the joint position statement of the Association of Mathematics Teacher Educators and the National Council of Teachers of Mathematics, *Principles to Guide the Design and Implementation of Doctoral Programs in Mathematics Education*[i]. This position statement indicates that the core knowledge

expectations for doctoral study in mathematics education include the following under "learning":
"Fundamental theories of learning mathematics provide the foundation for thinking about issues in mathematics education. Mathematics educators need to understand these theories and the distinctions among them in terms of both the kind of learning they are trying to explain and the theoretical constructs that have proven useful over time. A treatment of both historic and contemporary theories of learning should be a part of all doctoral programs in mathematics education. Drawing on current theories and research, doctoral students should understand how people of different ages, mathematical backgrounds, and aptitudes learn mathematics. This understanding may be accomplished by various means including courses, seminars, or special readings focusing on theories of learning and the accompanying research evidence. In addition, a doctoral program should provide opportunities for candidates to link their knowledge to practice in designing or evaluating curricula, setting learning goals, and creating cognitively appropriate patterns of instruction." (p. 5-6, AMTE, 2002)

Performance-Based Assessments
NOTE: All assessments have more detailed descriptions available on the Blackboard site for the course. Students will need to review these detailed descriptions prior to submission. Final papers should be submitted using the assignment submission tool in Blackboard.

1. *Curriculum Vitae* – Submit a copy of your CV. For samples, you can visit CEHD faculty web pages to find their CVs. http://gecd.mit.edu/jobs/find/prepare/cv is a guide to CV writing and provides additional links.

2. *Mathematics Knowledge and Understanding Review* – Submit a 20-page paper reviewing the research literature related to a particular mathematics topic. The review should include references from peer-reviewed journals and books describing the development of students' understanding and how various researchers have examined the topic.

3. *Position Paper* – Compare and contrast two positions in mathematics education (e.g., Behaviorism vs. Constructivism, problem-based learning vs. drill and practice, using calculators vs. paper-based activities) examining the fundamental tenets and propositions of each position. Describe the strengths and weaknesses of each position. Your arguments should be supported by literature from the field.

4. *Clinical Interview* – Find 3 students or adults and create a problem set to provide them during a clinical interview session about their understanding of a particular mathematical topic. Write a 5-10 page analysis of the interview results. What were their struggles? What concepts do they understand? Part of your work as a mathematics educator and researcher involves conducting interviews and understanding how people think about mathematics. This assignment is intended to help you develop both of these skill sets.

Blackboard site:
All assignments and supplemental readings will be available on the course Blackboard site (https://mymason.gmu.edu). All students enrolled in the course are enrolled in the Blackboard site. Use your Mason email login and password to enter the site.

> **NOTE: All assignments and readings are subject to change at the discretion of the instructor. Any changes will be announced in class and posted on the course Blackboard site.**

Assignment	Points
Curriculum Vitae	50
Mathematics Knowledge and Understanding Review	200
Position Paper	200
Clinical Interview	200
Class Participation	150
TOTAL	800

Formatting Assignments

All papers should follow the guidelines in the *Publication Manual of the American Psychological Association (6th Ed.)* for formatting reference lists, citations, the body of the paper, etc. As most classes and your dissertation will require APA 6th formatting, I strongly recommend purchasing the APA 6th Handbook.

Late Assignments

All assignments are due on the date listed in the schedule. 10% of points earned will be deducted for late work if students have not notified the instructor in advance of late submission and had the late submission approved.

GRADE	POINTS
A	720+
B	640-719
C	560-639
F	Less than 559

GMU Policies and Resources for students:

a. Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/honor-code/].
b. Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/

c. Students are responsible for the content of university communications sent to their George Mason University 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.
d. 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/].
e. Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
f. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
g. 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/].

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

Core Values Commitment
The College of Education & 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/

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See http://gse.gmu.edu/] For

Course Schedule

Date	Readings Due	Assignments Due
January 22, 2014	Skemp, Erlwanger	
January 29, 2014 *Number*	Verschaffel et al (HRMTL, 13) Lamon (HRMTL, 14) Brownell (CME)	
February 5, 2014	Talk by Barry Sloane (National Science Foundation)	CV
Feb 12, 2014 *Constructivism*	Steffe & Kieran (CME) Cobb & Yackel (CME)	Clinical Interview Problem Set
Feb. 19, 2014 *Learning Trajectories*	Sztajn, Confrey, Wilson & Edgington (2012) Szilágyi, Clements & Sarama (2013)	
Feb. 26, 2014 *Algebra*	Carraher & Schliemann, (HRMTL, 15) Kieran (HRMTL, 16)	
March 5, 2014 *Equity*	Fennema & Sherman (CME) Bishop & Forgasz (HRMTL, 26)	Clinical Interview Paper
March 12, 2014	*No Class – Spring Break*	
March 19, 2014 *Problem Solving*	Schoenfeld (CME) Kilpatrick (CME) Lesh & Zawojewski (HRMTL, 17)	
March 26, 2014 *Geometry*	vanHiele (CME) Battista (HRMTL, 19)	
April 2, 2014 *Early Childhood*	Clements & Sarama (HRMTL, 12)	
April 9, 2014 *Statistics*	Jones & Langrall, HRMTL, 20 Shaughnessy, HRMTL, 21	Math Knowledge Paper
April 16, 2014 *Proof*	Tall & Vinner (CME) Harel & Sowder (HRMTL, 18)	
April 23, 2014 *Post-Secondary*	Artigue et al (HRMTL, 22)	
April 30, 2014 *Informal Math*	Carraher et al (CME) D'Ambrosio (CME)	
May 7, 2014 *Diversity*	Diversity, (HRMTL, 10)	
May 14, 2014		Position Paper

CME=*Classics in Mathematics Education Research*
HRMTL, ## = *Second handbook of research on mathematics teaching and learning, Chapter XX*

[i]http://www.amte.net/sites/all/themes/amte/resources/publications/DoctoralProgramsinMathematicsEducation.pdf