

**George Mason University**  
**EDCI 666-001: RESEARCH IN MATHEMATICS TEACHING**  
 Spring 2012      3 credits  
 Class meets Thursday, 4:30-7:10, East 121

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**I. Course Description**

This course explores current issues and research literature in elementary school mathematics. It emphasizes the development of different styles of teaching and several methods of conducting research about mathematics education.

*Prerequisite:* Admission to the Mathematics Education Leadership Master’s Degree Program

**II. Course Learning Outcomes**

At the conclusion of this course, students should be able to:

- A. Study the teaching of mathematics through reading, interpreting, critiquing and synthesizing research.
- B. Develop an annotated bibliography that shows an in-depth knowledge of research in mathematics education.
- C. Utilize observational methods to study mathematics teaching and share the findings with participants and colleagues.
- D. Design an action research project to study mathematics teaching.

**III. Relationship of Course Learning Outcomes to National Professional Association Standards**

EDCI 666 is designed to enable mathematics education leaders to read, interpret, and evaluate issues in mathematics education research that impact mathematics teaching and learning. It is also designed to promote leadership in professional development and through effective collaboration with colleagues. The course follows the *Standards for Elementary Mathematics Specialists* outlined by the Association of Mathematics Teacher Educators (2010).

III. Leadership Knowledge and Skills

| <b>Indicator</b>   | <b>Evaluation</b>                                |
|--|--|
| <ul style="list-style-type: none"> <li>• Select from a repertoire of methods to communicate professionally about students, curriculum, instruction, and assessment to educational constituents—parents and other caregivers, school administrators, and school boards.</li> <li>• Use professional resources such as professional organization networks, journals, and discussion groups to be informed about critical issues related to mathematics teaching and learning, e.g., policy initiatives and curriculum trends.</li> </ul> | Annotated bibliography and in-class presentation |

|   |   |
|---|---|
| <ul style="list-style-type: none"> <li>Plan, develop, implement, and evaluate professional development programs at the school and district level and support teachers in systematically reflecting and learning from practice to assure that all students have appropriate opportunities to learn important mathematics.</li> </ul>   | <p>Observational practice</p> <p>Problem-based Assessment:<br/>Classroom observation and analysis</p>       |
| <ul style="list-style-type: none"> <li>Use leadership skills to improve mathematics programs at the school and district levels, e.g., develop appropriate classroom- or school-level learning environments; build relationships with teachers, administrators and the community; develop evidence-based interventions for high and low-achieving students; collaborate to create a shared vision and develop an action plan for school improvement; partner with school-based professionals to improve each student's achievement; mentor new and experienced teachers to better serve students.</li> </ul> | <p>Observational practice</p> <p>Classroom observation and analysis</p> <p>Action research project plan</p> |

#### IV. Nature of Course Delivery

The delivery of this course combines methods of lecture, in-class discussion, on-line discussion, independent study/research, student presentation, and writing.

#### V. Required Texts

Artzt, A., Armour-Thomas, E., & Curcio, F. (2007). *Becoming a reflective mathematics teacher: A guide for observations and self-assessment*. (2<sup>nd</sup> ed.). New York: Routledge.

Mason, J. (2002). *Researching your own practice: The discipline of noticing*. New York: Routledge.

McNiff, J. & Whitehead, J. (2011). *All you need to know about action research*. (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.

Choose one from NCTM's *Teachers Engaged in Research* series:

Smith, S. & Smith, M. (Eds.). (2006). *Inquiry into mathematics classrooms, prekindergarten-grade 2*. Greenwich, CT: Information Age Publishing.

Langrall, C. (Ed.). (2006) *Inquiry into mathematics classrooms, grades 3-5*. Greenwich, CT: Information Age Publishing.

Masingila, J. (Ed.). (2006). *Inquiry into mathematics classrooms, grades 6-8*. Greenwich, CT: Information Age Publishing.

Additional readings to be provided electronically or as handouts.

#### VI. Course Requirements and Assignments

As current and future leaders in mathematics education, you are and will be responsible for synthesizing information from complex sources and presenting coherent reports for a variety of stakeholders. For this course, you are expected to write **concise but high quality** papers, similar

to those you will likely write in the future. Your work will be evaluated on the **clarity** of the theme and key ideas put forth in the paper, the **coherence and organization** of the work, and the **adherence to stated page limits**. Strict page limits are a reality in publishing and report-writing, and it is important to present your ideas with brevity. All papers should follow APA Sixth Edition formatting guidelines. Rubrics for each assignment will be available on Blackboard.

**A. Annotated bibliography and presentation** (25% of final grade). Write an annotated bibliography that includes at least five articles related to a specific topic about researching mathematics teaching. Give a summary report or short presentation in class that could also be shared with parents, teachers, or administrators about the topic of study. Post the report to Blackboard so that others can use it as a resource. The bibliography is due on the day you give your presentation. **Maximum length of bibliography: 10 double-spaced pages**

**B. Observational practice** (20% of final grade).

1. Notice one's own practice based as explained in Mason (2002). First, create brief-but-vivid accounts to make disciplined observations about a particular part of your practice. Then use those accounts to analyze themes or issues through reworking the accounts, doing "reconnaissance" with colleagues, and identifying themes or threads in the observations. Finally, compile your accounts and analysis into a brief report that follows Mason's (2002) outline of the principal components of research (found on pages 154-155 and 185-186). **Maximum length: 10 double-spaced pages. Due March 22.**

2. Using a sample TIMMS video (available online), observe and analyze one of the critical aspects of instructional practice from Artzt et al. (Chapter 5) or from another topic in mathematics education research. Take notes about what you see in the classroom, and link your observations to possible influences on student learning. This is an **ungraded assignment**, but feedback will be given to help you hone your observation skills in preparation for the PBA. **Notes due April 5.**

**C. Problem-based Assessment: Classroom observation and analysis** (35% of final grade):

Observe a mathematics lesson and analyze the teaching using an appropriate protocol. Meet with the teacher to discuss the findings of the observation and to reflect on and learn from practice. The focus of the observation can be negotiated with the classroom teacher in order to be relevant to his or her practice, and it should also have a research base in the literature. **Maximum length: 15 double-spaced pages. Due April 19.**

**IV. Action research plan** (20% of final grade). Design an action research project about mathematics teaching to be completed during EDLE 791. Specific guidelines for the plan will correspond to suggestions by McNiff and Whitehead (2011). **Maximum length: 10 double-spaced pages. Due May 3.**

**V. Attendance and participation.** The quality of this course depends heavily and primarily on the regular attendance and participation of all involved. Participation will include taking part in discussions informed by critical reading and thinking, leading discussions about selected mathematics research, and sharing with the class the products of various writing, reflection, and field experience assignments. The expectations, demands and workload of this course are professional and high.

**Use of Electronic Devices during Class.** If you use an electronic device during class (laptop computer, tablet, phone, etc.) please be respectful of your peers and your instructor and do not engage in activities that are unrelated to class (i.e. email, text, chat, social networking, etc). Such disruptions show a lack of professionalism and detract from your engagement with the course material.

## **VII. Evaluation Criteria**

Determination of the Final Grade: Graduate Grading Scale

|    |          |    |           |
|----|----------|----|-----------|
| A  | 93%-100% | A- | 90%-92%   |
| B+ | 87%-89%  | B  | 80%-86%   |
| C  | 70%-79%  | F  | Below 70% |

## **VIII. George Mason University Policies and Resources for Students**

- A. Academic integrity (honor code, plagiarism): Students must adhere to guidelines of the George Mason University Honor Code [See <http://academicintegrity.gmu.edu/honorcode/>].
- B. Mason Email: 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, division, and program will be sent to students solely through their Mason email account. Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/1301ge.html>].
- C. Counseling and Psychological Services: 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/>].
- D. Office of Disability Services: 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 <http://ods.gmu.edu/>].
- E. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- F. The Writing Center (Optional Resource): 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/>].
- G. University Libraries (Optional Resource): The George Mason University Libraries provide numerous services, research tools, and help with using the library resources [See <http://library.gmu.edu/>].
- H. 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. More information can be found at the Graduate School of Education's [website](#).

## IX. Course Schedule

| Date  | Topic/Learning Experiences  | Readings and assignments due in class<br><i>Other readings may occasionally be added.</i>   |
|---|---|---|
| Jan. 26   | <p><i>Topic 1:</i> What does it mean to study teaching? Through what lenses do we study mathematics teaching?</p> <p>Reading and presenting educational research<br/>Sample topic: Technology</p> | <p>Mason, Ch. 9, “What IS research?”</p> <p>NCTM Professional Development Research Brief (2009) (optional)</p> <p>Ozel, Yetkiner, &amp; Capraro (2008) <b>or</b> Weist (2001)<br/>Risser (2011)<br/>Sturdivant, Dunham, &amp; Jarmin (2009)</p> |
| Feb. 2  | Classroom discourse   | <p>Cobb, Boufi, McClain, &amp; Whitenack (1997)<br/>Knuth &amp; Peressini (2001)<br/>Manouchehri &amp; St. John (2006)<br/>Williams &amp; Baxter (1997)</p>   |
| Feb. 9  | Diversity   | <p><b>Student presentation:</b></p> <p>NCTM Research Committee (2005)<br/>NCTM Student Learning Research Brief (2009)<br/>US Department of Education (2007)</p>   |
| Feb. 16   | Lesson study  | <p><b>Student presentation:</b></p> <p>Cooke (2002) TBA<br/>Fernandez &amp; Chokshi (2002)<br/>Tolle (2010)</p>   |
| Feb. 23   | <p><i>Topic 2:</i> Studying teaching through reflective practice, self-study, and observation</p> <p>Reflective practice</p>  | <p><b>Student presentation:</b></p> <p>Ball (1993)<br/>Lampert and Ball, TBA<br/>Schön, TBA</p>   |
| <p>Mar. 1</p> <p><b>Online class option synchronous</b></p> | Noticing one’s practice   | <p><b>Student presentation:</b><br/><b>Student presentation:</b></p> <p>Mason, Ch. 2-5</p> <p>Begin recording observational accounts</p>  |
| Mar. 8  | Noticing one’s practice<br>Observation “reconnaissance” with colleagues   | <p><b>Student presentation:</b></p> <p>Bring observations to class</p> <p>Mason, Ch. 6-7</p>  |
| Mar. 15   | <b><i>Mason Spring Break—no class</i></b>   |   |
| Mar. 22   | Observational research in the mathematics classroom   | <p><b>Student presentation:</b></p>   |

|   |   |   |
|---|---|---|
|   |   | Mason, Ch. 8<br>Artzt et al., Part I<br><b>“Noticing” exercises due</b>   |
| Mar. 29                                   | Observational research in the mathematics classroom<br><br>TIMMS video observation                          | <b>Student presentation:</b><br><br>Artzt et al., Ch. 5 and 8   |
| Apr. 5<br><b>ONLINE</b><br>(asynchronous) | <i>Topic 3: Using action research to study mathematics teaching</i><br>Preparing to design a research study | Hostetler (2005)<br><br><b>TIMMS video notes due</b>  |
| Apr. 12                                   | Research design   | <b>Student presentation:</b><br><br>Mason, Ch. 10-15<br><br>McNiff, J. & Whitehead, J. TBA  |
| Apr. 19                                   | Action research   | Self-selected chapters from <i>Teachers Engaged in Research</i> series<br><br>McNiff, J. & Whitehead, J., TBA<br><br><b>PBA Due</b>   |
| Apr. 26                                   | Linking research to practice  | <b>Student presentation:</b><br><br><i>Linking Research &amp; Practice: The NCTM Research Agenda Conference Report, Chapter 3</i><br><br>Self-selected chapters from <i>Teachers Engaged in Research</i> series             |
| May 3                                     | Linking research to practice  | <i>Putting Research into Practice in the Elementary Grades: Readings from Journals of the NCTM, Section 5</i><br><br>Self-selected chapters from <i>Teachers Engaged in Research</i> series<br><br><b>Research Plan Due</b> |
| May 10                                    | <b>Research design symposium</b>  |   |

Approved March, 2004. Revised January, 2012

## Scoring Rubric for Problem-Based Assessment

| AMTE Standard: Leadership Knowledge and Skills | <b>AMTE Indicators</b>  | <b>Exceeds Expectations</b>  | <b>Meets Expectations</b>  | <b>Approaches Expectations</b>  |
|--|---|--|--|---|
|  | Plan a professional development program (classroom observation and analysis).   | The research question is stated and justified.<br>The context for the study is described.<br>Methods for collecting and analyzing accounts are described and justified.<br>The purpose of the study is clearly articulated and justified.<br>The observational protocol is well-designed for the purpose of the research.<br>The research closely aligns with the cooperating teachers' needs. | The research question is stated.<br>The context for the study is mentioned.<br>Methods for collecting and analyzing accounts are described.<br>The observational protocol is appropriate for the research project.<br>The purpose of the study is addressed. | The research question is limited.<br>The context for the study is described briefly or not at all.<br>Methods for collecting and analyzing accounts are described briefly.<br>The observational protocol does not align well with the purpose or design of the project.<br>The purpose of the study is not addressed. |
|  | Support teachers in systematically reflecting and learning from practice to assure that all students have appropriate opportunities to learn important mathematics. | Data includes strong evidence that the cooperating teacher engaged in reflection about the research topic, findings, and/or recommendations.<br>Analysis includes evidence that the teacher learned from the project.  | Data includes some evidence that the teacher engaged in reflection on the research.<br>Analysis includes some evidence of teacher learning.  | It is not clear that the teacher engaged in reflection during the project.<br>There is little evidence of teacher learning.   |
|  | Use leadership skills to improve mathematics programs at the school level.  | Claims include relevant, insightful, and realistic suggestions for improving student learning.   | Claims include suggestions for improving student learning.   | Few or no suggestions are made for improving student learning.  |
|  | Use leadership skills to build relationships with teachers.   | There is clear evidence of meaningful collaboration and reflection with the teacher (i.e. negotiation of research topic, discussion of findings, formulation of next steps or improvement plan, etc.).   | There is some evidence of meaningful collaboration with the teacher.   | There is little evidence of a meaningful relationship with the teacher.   |
|  | Use professional resources to be informed about critical issues related to mathematics teaching and learning.   | Literature is used to justify the area of focus and claims of findings.  | Literature is used to describe the area of focus and claims of findings.   | Literature is not used to support the project.  |