

Graduate School of Education George Mason University
EDCI 857: Preparation and Professional Development
of Mathematics Teachers
Spring 2013

Instructor: Dr. Jennifer Suh

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Office Hours: By appointment Class meets: Tuesday at 4:30

A. Course Description

This seminar is for students in the Mathematics Education Leadership Ph.D. program. Students study attributes of effective professional development in mathematics education, develop expertise in designing and teaching mathematics methods courses, and learn to create and teach professional development experiences for practicing teachers.

Prerequisite: Admission to the Mathematics Education Leadership Ph.D. program.

B. Student Outcomes

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

1. Research and study design models for the delivery of mathematics professional development activities and research about mathematics teacher knowledge.
2. Test theories and techniques of mathematics professional development in field experiences with adult learners.
3. Develop expertise in designing and teaching mathematics methods courses and in organizing and teaching professional development experiences for practicing teachers.
4. Select and use technology to facilitate and support learning goals.
5. Summarize and present the results of a pilot professional development activity in mathematics following its implementation.

C. Required Readings

Loucks-Horsley, S. Love, N, Stiles, K., Mundry, S., & Hewson, P.W. (2003). *Designing Professional Development for Teachers of Science and Mathematics*. Corwin Press, Inc.

Lester, F. (2008). *Handbook of Research on Mathematics Teaching and Learning*. Reston, VA: National Council of Teachers of Mathematics. (PART I of the HANDBOOK OF RESEARCH)

Other suggestions for research methods on teacher education

Kelly, A., & Lesh, R. (2000). *Handbook of research design in mathematics and science education*. Mahwah, NJ: Lawrence Erlbaum.

D. Assignments

1. *Teacher Knowledge, Learning and Development Literature Review Paper with Annotated bibliography (25%)*

In previous courses in the MEL doctoral program, you have investigated topics and developed annotated bibliographies based on research in the education community. The review of the research in this course will focus on mathematics teacher knowledge, learning and development. To extend that work and to help you to prepare for the literature review process for your dissertation, in this course you will be learning how to assemble literature, organize literature into themes, and construct a literature review paper. The assignment will be completed progressively throughout the course with benchmark assignments.

2. *Leading Reading Discussions (need to schedule session) (10%)*

You will be responsible for leading and organizing a discussion of one of the readings for our class. This will provide you an opportunity to lead a discussion (through raising issues, questions and comments) with adult learners and to examine more closely one of the readings and its themes for the course. You may draw on other resources and materials. You will need to consult the instructor and provide a plan for your discussion prior to the class session you are leading.

3. *Professional Development Grant Proposal (30%)*

As preparation for organizing projects and grants related to teacher professional development and research, you will write a 3-4 page idea paper outline preliminary plans for the PD grant in November for a grant project of your choosing related to mathematics teaching and submit a 12-15 page proposal to your instructor in April which will include a) Needs Assessment, b) Research Base, c) Description of Program Goals, Activities and Timeline, & d) Evaluation and Accountability Plan.

Professional Development Grant Proposal:

1. Needs Assessment: A needs assessment should be included with a brief description of the methodologies used to collect this information.
2. Description of Program Goals, Activities and Timeline: This section should show a clear connection between project goals and planned activities, along with a description of the activities and how professional development needs are addressed. A clear description of the implementation plan, where the programs will be offered, and an activity timeline should also be addressed.
3. Research Base: A description of the demonstrated connection of project activities with scientifically-based research and appropriate methodology for project implementation. Provide a list of references and resources used to complete this narrative. .
4. Evaluation and Accountability Plan: Describe the plan that will be used to evaluate the program. This plan **must** include:
 1. rigorous measures of the impact that implemented intervention activities have on increasing student achievement in participating schools;
 2. a research design with measurable objectives to increase the content knowledge of mathematics teachers who participate in content-based professional development activities;
 3. measures of progress towards meeting the assessed needs

4. *Curriculum Vitae and Cover Letter (5%)*

You will update your curriculum vitae and write a cover letter describing your experiences as a mathematics educator.

5. Designing a *Professional Development Session & Reflection (schedule session) (20%)*
Design and deliver a Professional development session for local, regional, national conference/or teach a session in a methods course. Write a reflection and share out the major components of the PD that was successful in developing teacher knowledge through a powerpoint and a brief paper integrating what you have read and the how the design and content reflections your understanding of effective professional development (~5 pages).

6. Position Statement (10%)

NOTE: The instructor reserves the right to change the contents of this syllabus at any time and will announce such changes in a timely fashion.

Grading Policy

As a doctoral student, it is your job to learn as much as you can from this course, the assignments and the readings. The assignments have been designed to allow you to pursue independent interests within the boundaries of the topics of the course. The assignments and readings are also designed to help you both learn about the content of the course and develop your skills as a mathematics educator.

Assignments are graded on a four-level scale: exceeds expectations, meets expectations, needs revision, and unacceptable. Specific requirements for each assignment will be provided with the assignment descriptions. Letter grades are assigned as follows.

Policy on Incompletes:

If circumstances warrant, a written request for an incomplete must be provided to the instructor for approval prior to the course final examination date. Requests are accepted at the instructor's discretion, provided your reasons are justified and that a *major* percentage of your work has already been completed. Your written request should be regarded as a contract between you and the instructor and must specify the date for completion of work. This date must be at least two weeks prior to the university deadline for changing incompletes to letter grades.

E. Relationship to Program Goals and Professional Organization

EDCI 857 is designed to enable mathematics education leaders to identify, develop and use instructional strategies consistent with the key attributes of effective professional development experiences for mathematics teachers. 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*. This position statement indicates that the core knowledge expectations for doctoral study in mathematics education include:

- Participate in mentored clinical experiences that develop expertise in designing and teaching mathematics content and methods courses for teachers,
- Organize and teach professional development experiences for practicing teachers,
- Demonstrate knowledge about research on teaching and teacher education, •
- Articulate knowledge of historical, social, political and economic factors impacting
- mathematics education,

- Become familiar with reports from major commissions, committees, and professional organizations,
- Help practicing teachers acquire knowledge of research on teaching and translate it to their own practice,
- Demonstrate confidence and competence in choosing and using effective instructional strategies consistent with mathematics learning goals, and
- Critically reflect about one's own teaching.

• **COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:**

The Graduate School of Education (GSE) expects that all students abide by the following: Students are expected to exhibit professional behavior and dispositions. See gse.gmu.edu for a listing of these dispositions. Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#TOC_H12 for the full honor code. Students must agree to abide by the university policy for Responsible Use of Computing. See <http://mail.gmu.edu> and click on Responsible Use of Computing at the bottom of the screen. Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

TASKSTREAM REQUIREMENTS

Every student registered for any MEL course with a required performance-based assessment (will be designated as such in the syllabus) is required to submit this assessment (*Professional Development Grant Proposal*) to TaskStream (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor). Evaluation of your performance-based assessment will also be provided using TaskStream. Failure to submit the assessment to TaskStream will result in a the course instructor reporting the course grade as Incomplete(IN). Unless this grade is changed upon completion of the required TaskStream submission, the IN will convert to an F nine weeks into the following semester.

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/1301gen.html>].
- 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/>].

SCHEDULE . Readings may be subject to change based on seminar discussions

<p>Session 1 1/22/13 Tues</p>	<p>Overview and introduction Position paper Improving Classroom Instruction: Hiebert, J., & Morris, A. (2011). Teaching, rather than teachers, as a path toward improving classroom instruction. <i>Journal of Teacher Education</i>, 63(2), 92-102.</p>
<p>Session 2 1/29/13 Tues</p>	<p>Improving Classroom Instruction: Hiebert, J., & Morris, A. (2011). Teaching, rather than teachers, as a path toward improving classroom instruction. <i>Journal of Teacher Education</i>, 63(2), 92-102. Commentaries: Catherine C. Lewis, Rebecca R. Perry, Shelley Friedkin, and Jillian R. Roth, Improving Teaching Does Improve Teachers: Evidence from Lesson Study <i>Journal of Teacher Education November/December 2012 63: 368-375, doi:10.1177/0022487112446633</i> Lampert, M. (2012). Improving Teaching and Teachers: A “Generative Dance”? <i>Journal of Teacher Education</i>, 63: 361-367, doi:10.1177/002248711244711 Ken Zeichner, The Turn Once Again Toward Practice-Based Teacher Education <i>Journal of Teacher Education November/December 2012 63: 376-382, doi:10.1177/0022487112445789</i> .</p>
<p>Session 3 2/5/13 Tues</p>	<p>Perspectives from Inside the Field Knowledge for Teaching Ball, D. L., Thames, M. H., & Phelps, G. (2008). Knowledge for teaching: What makes it special? <i>Journal of Teacher Education</i>, 59(5), 389-407. Ben-Peretz, M. (2011). Teacher knowledge: What is it? How do we uncover it? What are its implications for schooling? <i>Teaching and Teacher Education</i>, 27, 3-9 Lampert, M. (2010). Learning teaching in, from, and for practice: What do we mean? <i>Journal of Teacher Education</i>, 61(1-2), 21-24</p>
<p>Session 4 2/12/13 Tues</p>	<p>Teacher Education and the American Future Linda Darling-Hammond <i>Journal of Teacher Education</i> 2010 61: 35 DOI: 10.1177/0022487109348024 Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. <i>Educational Researcher</i> 33(8), 3-15. *Loucks- Horsley, S. Love, N, Stiles, K., Mundry, S., & Hewson, P.W. (2003). <i>Designing Professional Development for Teachers of Science and Mathematics</i>. Corwin Press, Inc. Chapter 1-2</p>

<p>Session 5</p> <p>2/19/13 Tues</p>	<p>Teacher Understanding of Mathematics</p> <p>*Loucks- Horsley, S. Love, N, Stiles, K., Mundry, S., & Hewson, P.W. (2003). <i>Designing Professional Development for Teachers of Science and Mathematics</i>. Corwin Press, Inc. Chapter 3-4</p> <p>Ball, D. (2003). What mathematical knowledge is needed for teaching mathematics? Paper presented at the February 6, 2003 Secretary's Summit on Mathematics, Washington, DC. Retrieved March 18, 2010 from www.erusd.k12.ca.us/ProjectAlphaWeb/index.../BallMathSummitFeb03.pdf</p> <p>Ma, L. (1999). <i>Knowing and teaching elementary mathematics: Teachers understanding of fundamental mathematics in China and the United States</i>. Mahwah, NJ: Lawrence Erlbaum Associates. Introduction, pp. xvii-xxv Chapter 2 Multidigit Number Multiplication, pp. 28-54 Chapter 5 Teachers' Subject Matter Knowledge: Profound Understanding of Fundamental Mathematics, pp 107-124</p> <p>Recommended: Kennedy, M. M. (1998). Education reform and subject matter knowledge. <i>Journal of Research in Science Teaching</i>, 35(3), 249-263. Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. <i>Educational Researcher</i>, 15(2), 4-14.</p>
<p>Session 6</p> <p>2/26/13 Tues</p>	<p>Designing Professional Development</p> <p>*Loucks- Horsley, S. Love, N, Stiles, K., Mundry, S., & Hewson, P.W. (2003). <i>Designing Professional Development for Teachers of Science and Mathematics</i>. Corwin Press, Inc. Chapter 5-6</p> <p>Lampert, M. (1990). When the problem is not the question and the solutions is not the answer: Mathematical knowing and teaching. <i>American Educational Research Journal</i>, 27, 29-63.</p>
<p>Session 7</p> <p>3/5/13 Tues</p> <p>Next week is GMU break 3/11-3/17</p>	<p>Examples of Professional Practice in the Literature</p> <p>Boston, M. D. & Smith, M. S. (2009). Transforming secondary mathematics teaching: Increasing the cognitive demands of instructional tasks used in teachers' classrooms. <i>Journal for Research in Mathematics Education</i>, 40 (2), 119-156.</p> <p>Fernandez, C., & Yoshida, M. (2004). <i>Lesson study: A Japanese approach to improving mathematics teaching and learning</i>. Mahwah, NJ: Lawrence Erlbaum.</p> <p>Kazemi, E., & Franke, M. L. (2004). Teacher learning in mathematics: Using</p>

	<p>student work to promote collective inquiry. <i>Journal of Mathematics Teacher Education</i>, 7, 203-235.</p>
<p>Session 8</p> <p>3/19/13 Tues</p>	<p>Professional Development Frameworks</p> <p>Kazemi, E., & Hubbard, A. (2008). New directions for the design and study of professional development: Attending to the coevolution of teachers' participation across contexts. <i>Journal of Teacher Education</i>, 59(5), 428-441.</p> <p>Simon, M. A. (1995). Reconstructing mathematics pedagogy from a constructivist perspective. <i>Journal for Research in Mathematics Education</i>, 26(2), 114-145.</p> <p>Recommended: Silverman, J. & Thompson, P. W. (2008). Toward a framework for the development of mathematics knowledge for teaching. <i>Journal of Mathematics Teacher Education</i>, 11, 499-511.</p>
<p>Session 9</p> <p>3/26/13 Tues</p>	<p>Measuring Teacher Knowledge</p> <p>Kersting, N. B., Giviin, K. B., Sotelo, F. L., & Sitgler, J. W. (2002). Teachers' analyses of classroom video predict student learning of mathematics: Further explorations of a novel measure of teacher knowledge. <i>Journal of Teacher Education</i>, 61(1-2), 172-181.</p> <p>***Hill, H., Sleep, L., Lewis, J., & Ball, D. (2008). Assessing Teachers Mathematics knowledge: that knowledge matters and what evidence counts? In F. Lester (Ed.), <i>Handbook of Research on Mathematics Teaching and Learning</i> (pp. 1169-1207). Reston, VA: NCTM.</p> <p>Recommended Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. <i>American Educational Research Journal</i>, 42(2), 371-406.</p>
<p>Session 10</p> <p>4/2/13 Tues</p>	<p><i>Teacher Preparation and Professional Learning</i></p> <p>***Franke, M., Kazemi, E., & Battey, D., (2007). Mathematics teaching and classroom practice. In F. K. Lester, Jr. (Ed.), <i>Second handbook of research on mathematics teaching and learning</i> (pp. 225-256). Reston: NCTM.</p> <p>Greenberg, J., & Walsh, K. (2008). No common denominator: The preparation of elementary teachers in mathematics by American's education schools (Executive Summary). Washington, D.C., National Council on Teacher Quality.</p>
<p>Session 11</p>	<p><i>Teacher Preparation and Professional Learning</i></p>

<p>4/9/13 Tues</p> <p>Professional Development Lit review Due (25%)</p>	<p>***Sowder, J. T. (2007). The mathematical education and development of teachers. In F. K. Lester, Jr. (Ed.), <i>Second handbook of research on mathematics teaching and learning</i> (pp. 157-223). Charlotte, NC: Information Age Publishers and National Council of Teachers of Mathematics.</p> <p>Borko, H., Peressini, D., Romagnano, L., Knuth, E., Willis-Yorker, C., Wooley, C., Hovermill, J., & Masarik, K. (2000). Teacher education does matter: A situative view of learning to teach secondary mathematics. <i>Educational Psychologist</i>, 35(3), 193-206.</p>
<p>Session 12</p> <p>4/16/13 Tues</p>	<p>Teacher Beliefs & Identity</p> <p>***Philipp, R., (2007). Mathematics teachers' beliefs and affect. In F. K. Lester, Jr. (Ed.), <i>Second handbook of research on mathematics teaching and learning</i> (pp. 225-256). Charlotte, NC: Information Age Publishers and National Council of Teachers of Mathematics</p> <p>Walls, F. (2010). The good mathematics teacher: Standardized mathematics tests, teacher identity, and pedagogy. In M. Walshaw (Ed.), <i>Unpacking pedagogy: New perspectives for mathematics classrooms</i> (pp. 65-83). Charlotte, NC: Information Age Publishing, Inc.</p> <p><i>Recommended</i></p> <p>Philipp, R. A., Ambrose, R., Sowder, J. T., Schappelle, B. P., Sowder, L., Thanheiser, E., Chauvot, J. (2007). Effects of early field experiences on the mathematical content knowledge and beliefs of prospective elementary school teachers: An experimental study. <i>Journal for Research in Mathematics Education</i>, 38(5), 438-476.</p>
<p>Session 13</p> <p>4/23/13 Tues</p>	<p>Large Scale Studies of Professional Development</p> <p>Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. <i>American Educational Research Journal</i>, 38(4), 915-945.</p> <p>Heck, D. J., Banilower, E. R., Weiss, I. R., & Rosenberg, S. L. (2008). Studying the effects of professional development: The case of the NSF's local systemic change through teacher enhancement initiative. <i>Journal for Research in Mathematics Education</i>, 39(2), 113-152.</p> <p>Recommended.</p> <p>Garet, M.S., Wayne, A. J., Stancavage, F., Taylor, J., Eaton, M., Walter, K....& Warner, E. (2011). <i>Middle school mathematics professional development impact study: Findings after the second year of implementation</i>. Washington, DC: National Center for Educational Statistics & U. S. Department of Education. Executive Summary (pp. xv-xxviii)</p>

<p>Session 14</p> <p>4/30/13</p> <p>Professional Development Grant Proposal due (25%)</p>	<p>Alternative Certification</p> <p>Good, T. L., McCaslin, M., Tsang, H. Y., Zhang, J., Wiley, C. R. H., Bozack, A.R., & Hester, W. (2006). How well do 1st-year teachers teach: Does type of preparation make a difference? <i>Journal of Teacher Education</i>, 57(4), 410-430.</p> <p>Humphrey, D. C., & Wechsler, M. E. (2008). Getting beyond the label: What characterizes alternative certification programs? In P. Grossman & S. Loeb (Eds.), <i>Alternative routes to teaching: Mapping the new landscape of teacher education</i> (pp. 65-97). Cambridge, MA: Harvard Education Press.</p> <p>Zientek, L. R. (2007). Preparing high-quality teachers: Views from the classroom. <i>American Educational Research Journal</i>, 44(4), 959-1001.</p> <p><i>Recommended</i></p> <p>Grissom, J. A. (2008). But do they stay? Addressing issues of teacher retention through alternative certification. In P. Grossman & S. Loeb (Eds.), <i>Alternative routes to teaching: Mapping the new landscape of teacher education</i> (pp. 129-155). Cambridge, MA: Harvard Education Press.</p>
<p>Session 15 *</p> <p>Professional Development Session & Reflection due as you schedule</p>	<p>Professional Development workshop/conference(scheduled individually)</p>

Sign up to Share PD demo session

Feb: _____

Mar: _____

April: _____

May: _____

Sign up to lead discussion

Feb: _____

Mar: _____

April: _____

May: _____

PBA FOR THE COURSE

Professional Development Grant Proposal (25%)

As preparation for organizing projects and grants related to teacher professional development and research, you will write a 3-4 page idea paper outline preliminary plans for the PD grant in February for a grant project of your choosing related to mathematics teaching and submit a 15-20 page proposal to your instructor in April which will include a) Needs Assessment, b) Research Base, c) Description of Program Goals, Activities and Timeline, & d) Evaluation and Accountability Plan.

Professional Development Grant Proposal:

1. Needs Assessment: A needs assessment should be included with a brief description of the methodologies used to collect this information. It should also refer to research literature that connects identified need and current research.
2. Description of Program Goals, Activities and Timeline: This section should show a clear connection between project goals and planned activities, along with a description of the activities and how professional development needs are addressed. A clear description of the implementation plan, where the programs will be offered, and an activity timeline should also be addressed.
3. Research Design: A description of the demonstrated connection of project activities with scientifically-based research and appropriate methodology for project implementation. Provide a list of references and resources used to complete this narrative. .
4. Evaluation and Accountability Plan: Describe the plan that will be used to evaluate the program. This plan **must** include:
 1. rigorous measures of the impact that implemented intervention activities have on increasing student achievement in participating schools;
 2. a research design with measurable objectives to increase the content knowledge of mathematics teachers who participate in content-based professional development activities;
 3. measures of progress towards meeting the assessed needs

Needs Assessment Points will be awarded for: a) identification and documentation of professional development needs; b) inclusion of relevant student achievement data; and c) demonstration of a clear relationship between need and project goals.	25
Program Plan Points will be awarded for: a) demonstration of a clear connection between project goals and planned activities; b) description of activities of partners and how professional development needs are addressed; c) demonstration of alignment of activities with Virginia Standards of Learning; d) description of how activities meet MSP priority criteria; and	35

e) inclusion of a clear description of implementation and timeline of plan.	
Research Design Points will be awarded for: a) demonstrated connection of project activities with scientifically-based research; and b) description of research design and appropriate methodology for project implementation and data changes.	15
Evaluation and Accountability Plan Points will be awarded for: a) measurement of gains in teacher content knowledge; b) measurement of progress in meeting needs of LEA; and c) a plan for measuring gains in student achievement.	25
Total Possible Points	100