

**GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT
GRADUATE SCHOOL OF EDUCATION
MATHEMATICS EDUCATION LEADERSHIP**

**EDCI 857 001: Preparation and Professional Development of Mathematics Teachers
Spring 2015, 3 Credits
Wednesdays, 4:30pm, Music/Theater Building 1008**

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Course description

A. Prerequisites/Corequisites

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. University Catalog Course Description

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.

Learner Outcomes

At the conclusion of this 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, and
5. Summarize and present the results of a pilot professional development activity in mathematics following its implementation.

Professional Standards

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

Required Texts

Lester, F. (Ed.). (2008). *Handbook of research on mathematics teaching and learning*. Reston, VA: National Council of Teachers of Mathematics. (PART I of the HANDBOOK OF RESEARCH)

Loucks-Horsley, S. Love, N, Stiles, K., Mundry, S., & Hewson, P.W. (2003). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press, Inc.

Suggested (but not required) text for research methods on teacher education

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

Course Assignments

1. Position Statement Paper (10%)

In your position statement, briefly discuss your own professional preparation and professional development. How can we best prepare teachers and continue to develop them in the field? What role do you see yourself serving in preparing and developing teachers? If your PD had to have a focus, what would it be and why? Finally, what do you hope to gain from this course?

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. Discussion Leadership Assignment (10%)

In order to engage you in synthesizing ideas across readings, each participant will be responsible for coordinating one class discussion (and/or some activity designed to support ideas presented in the readings) and supporting another of your fellow classmates in one other session related to the assigned readings. You will be required to complete a self-assessment of your role.

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 outlining preliminary plans for a PD grant for a grant project of your choosing related to mathematics teaching.

You will 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, and d) Evaluation and Accountability Plan.

Professional Development Grant Proposal Guidelines:

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:
 - a. rigorous measures of the impact that implemented intervention activities have on increasing student achievement in participating schools;
 - b. a research design with measurable objectives to increase the knowledge of mathematics teachers who participate in content-based professional development activities;
 - c. 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).

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.

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.

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 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/>].

Proposed Class Schedule: *Readings may be subject to change based on seminar discussions*

<p>Session 1 1/21/15</p>	<p>Overview and introduction Position Paper (Upload to Blackboard and bring to class) Improving Classroom Instruction: Fenstermacher, R. & Richardson, V. (2005). On making determinations of quality in teaching. <i>Teachers College Record</i>, 107(1), 186–213.</p>
<p>Session 2 1/28/15</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. Related Commentaries: Lewis, C., Perry, R., Friedkin, S., & Roth, J. (2012). Improving teaching does improve teachers: Evidence from lesson study. <i>Journal of Teacher Education</i>, 63, 368-375. Lampert, M. (2012). Improving teaching and teachers: A “generative dance”? <i>Journal of Teacher Education</i>, 63: 361-367. Zeichner, K. (2012). The turn once again toward practice-based teacher education. <i>Journal of Teacher Education</i>, 63, 376-382. Schoenfeld, A. (2014). What makes for powerful classrooms, and how can we support teachers in creating them? A story of research and practice intertwined. <i>Educational Researcher</i>, 43(8), 404–412.</p>
<p>Session 3 2/4/15</p>	<p>Perspectives from Inside the Field 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. (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 4 2/11/15 (online session)</p>	<p>Teacher Education and the American Future Darling-Hammond, L. (2010). Teacher education and the American future. <i>Journal of Teacher Education</i>, 61(1-2), 35–47. 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 2/18/15</p>	<p>Teacher Understanding of Mathematics</p> <p>Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. <i>Educational Researcher</i>, 15(2), 4-14.</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>Session 6 2/25/15</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>Campbell, P. Nishio, M., Smith, T., Clark, L., Conant, D., Rust, A., . . . (2014). The relationship between teachers' mathematical content and pedagogical knowledge, teachers' perceptions, and student achievement. <i>Journal for Research in Mathematics Education</i>, 45(4), 419-459.</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 7 3/4/15</p> <p>(Spring Break is next week, 3/11)</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>Recommended: Desimone, L., Smith, T., Phillips, K. (2013). Linking student achievement growth to professional development participation and changes in instruction: A longitudinal study of elementary teachers in Title I schools. <i>Teachers College Record</i>, 115, 1-46.</p>

<p>Session 8 3/18/15</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>Charalambous, C. (2010). Mathematical Knowledge for teaching and task unfolding: An exploratory study. <i>The Elementary School Journal</i>, 110(3), 247-278.</p> <p>Kazemi, E., & Franke, M. L. (2004). Teacher learning in mathematics: Using student work to promote collective inquiry. <i>Journal of Mathematics Teacher Education</i>, 7, 203-235.</p>
<p>Session 9 3/25/15</p>	<p>Professional Development Frameworks</p> <p>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>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 10 4/1/15</p>	<p>Teacher Preparation and Professional Learning</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 4/8/15</p>	<p>Teacher Preparation and Professional Learning</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 4/17/15</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>Clark, L, Depiper, J., Frank, T., Nishio, M., Campbell, P., Smith, T., Griffin, M., Rust, A., Conant, D., & Choi, Y. (2014). Teacher characteristics associated with mathematics teachers' beliefs and awareness of their students' mathematical dispositions. <i>Journal for Research in Mathematics Education</i>, 45(2), 246-284.</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> 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 4/22/15</p>	<p>Large Scale Studies of Professional Development 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. 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 4/29/15</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> 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>

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

<p>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.</p>	<p>25</p>
<p>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</p>	<p>35</p>

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	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	25
Total Possible Points	100