Graduate School of Education
George Mason University
EDCI 857: Preparation and Professional Development of Mathematics Teachers
Fall 2009-Spring 2010

Instructor: Dr. Jennifer Suh
Office Phone: 703-993-9119 Cell: (703)973-4642
Office: Commerce II Building Suite 200
Email: jsuh4@gmu.edu

Office Hours: By appointment
Class meets: 2nd Saturday monthly

A. Course Description

Yearlong seminar 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

See attached list of selected readings from the following books

Darling Hammond, L. &Bransford, J. (2005). *Preparing Teachers for a Changing World.* National Academy of Education and Jossey Bass, Inc.

Fernandez, C., & Yoshida, M. (2004). *Lesson study: A Japanese approach to improving mathematics teaching and learning*. Mahwah, NJ: Lawrence Erlbaum.

Hill, H., Sleep, L., Lewis, J., & Ball, D. (2008). Assessing Teachers Mathematics knowledge: that knowledge matters and what evidence counts? In F. Lester (Ed.), *Handbook of Research on Mathematics Teaching and Learning* (pp. 1169-1207). Reston, VA: NCTM.

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

Lester, F. (2008). *Handbook of Research on Mathematics Teaching and Learning*. Reston, VA: National Council of Teachers of Mathematics. (PART II 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.* Corwin Press, Inc.

Wood, T., Nelson, B. S., & Warfield, J. (2001). *Beyond classical pedagogy: Teaching elementary school mathematics*. Mahwah, NJ: Lawrence Erlbaum.

Selected chapters from Second Handbook (Lester, 2008)

4. Assessing teachers' mathematical knowledge : what knowledge matters and what evidence counts? / Heather C. Hill ... [et al.]

5. The mathematical education and development of teachers / Judith T. Sowder

6. Understanding teaching and classroom practice in mathematics / Megan Loef Franke, Elham Kazemi, Daniel Battey

Selected Chapters from *Handbook on Research Design*

Ball, D. L. (2000). Working on the inside: Using one's own practice as a site for studying teaching and learning. In R. Lesh & A. Kelly (Eds.), *Handbook of research design in mathematics and science education* (pp. 365-402). Mahwah, NJ: Lawrence Erlbaum.

Cobb, P. (2000). Conducting teaching experiments in collaboration with teachers. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 307-334). Mahwah, NJ: Lawrence Erlbaum.

Doerr, H. M., & Tinto, P. P. (2000). Paradigms for teacher-centered classroom-based research. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education*. Mahwah, NJ: Lawrence Erlbaum.

Feldman, A., & Minstrell, J. (2000). Action research as a research methodology for the study of the teaching and learning of science. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 429-456). Mahwah, NJ: Lawrence Erlbaum.

Lesh, R., & Kelly, A. (2000). Multitiered teaching experiments. In A. E. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 197-230). Mahwah, NJ: Lawrence Erlbaum.

Simon, M. A. (2000). Research on the development of mathematics teachers: The teacher development experiment. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 335-360). Mahwah, NJ: Lawrence Erlbuam.

Steffe, L. P., & Thompson, P. W. (2000). Teaching experiment methodology: Underlying principles and essential elements. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 267-306). Mahwah, NJ: Erl

D. Assignments

1. *Teacher Knowledge, Learning and Development Literature Review Paper*

   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*

   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*

   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.

4. *Curriculum Vitae and Cover Letter*

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

5. *Professional Development Session & Reflection*

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. Letter grades are assigned as follows.

A	Student meets or exceeds expectations on all assignments. Student demonstrates commitment to class participation.
B	Student meets expectations on the Literature Review Paper. Either Leading a Discussion or the Letter of Intent needs revision. Student has completed all assignments. Student demonstrates commitment to class participation.
C	Multiple assignments need revision, do not meet expectations or are incomplete. Student does not participate in class.
F	Multiple assignments submitted are unacceptable.

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 *majo*r 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.

Class Date	Course Topic	Readings Due at Class	Component of Lit Review Due	Other Assignments
September 12	Basics of Teacher Knowledge	Shulman, 1986 Desimone, 2008		
October 10	Professional Development of Mathematics Teachers Multi-tiered Teaching Experiments	Second Handbook (Lester) Chapter 5. The mathematical education and development of teachers / Judith T. Sowder *Lesson Study* Readings on Blackboard Lewis (ER article) Lesh, 2003 *HRD*, Ch. 9 Multitiered Teaching Experiments (Lesh & Kelly, 2000)	Focus topic, have at least 10 related articles	First draft of Letter of Intent _____ _____
November 14	Mathematics Knowledge for Teaching	Second Handbook (Lester) Chapter 4. Assessing teachers' mathematical knowledge : what knowledge matters and what evidence counts? / Heather C. Hill ... [et al.] Readings on blackboard as assigned by instructor *Review Instruments on blackboard	Select topic, have at least 2 related articles	C.V. and Cover Letter _____ _____
December 12	Models of Teacher Development	Darling Hammonds – Preparing Teachers for a Changing World Chapter 10 & 11 How teachers learn and develop & The design of teacher education programs * Evaluation of mathematics methods courses, syllabi and course texts	Continue gathering articles, develop themes	*Lead a discussion/ _____ _____

February 13	Teaching Experiments	Second Handbook (Lester) Chapter 6. Understanding teaching and classroom practice in mathematics / Megan Loef Franke, Elham Kazemi, Daniel Battey *HRD*, Ch. 11 Teaching Experiment Methods (Steffe & Thompson, 2000) *HRD*, Ch. 12 (Cobb, 2000) Conducting Teaching Experiments in Collaboration with Teachers	Detailed outline of literature review due	*Lead a discussion/ _____ _____
March 13	Teacher-Centered Research	*HRD*, Ch. 14 (Ball, 2000) *HRD*, Ch. 15 (Doerr & Tinto, 2000) *HRD*, Ch. 16 (Feldman & Minstrell, 2000)	First draft of literature review	*Lead a discussion/share PD project. _____ _____
April 10	Trajectories of Teacher Development	*HRD*, Ch. 13 (Simon, 2000) Research on the Development of math teachers: the Teacher development experiment & Readings on blackboard as assigned by instructor	Revise literature review	Final Draft of Letter of Intent *Lead a discussion _____ _____
May 8	Teachers and Technology	Chapter 7. Mathematics teachers' beliefs and affect / Randolph A. Philipp Readings on blackboard as assigned by instructor	Final draft of lit. review	_____ _____

Professional Development Grant Proposal:

A. Needs Assessment: A needs assessment should be included with a brief description of the methodologies used to collect this information.

B. 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.

C. 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. .

D. 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

Sign up to Share PD session reflection

Feb: _____ _____
_____ _____

Mar: _____ _____
_____ _____

April: _____ _____
_____ _____

May: _____ _____
_____ _____