MSED 511 — Effective Teaching of Mathematics

Northern Michigan University Summer 2006
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Course Description

Methods, materials, curriculum development, and evaluation in K-12 mathematics. Includes principles of learning applied to mathematics and strategies for teaching concepts, generalizations, skills, problem solving. Also includes experiences with hands-on learning activities (manipulatives), cooperative learning, classroom discourse, and meeting the needs of all students.

Course Overview

> Imagine a classroom, a school, or a school district where all students have access to high-quality, engaging mathematics instruction. There are ambitious expectations for all, with accommodation for those who need it. Knowledgeable teachers have adequate resources to support their work and are continually growing as professionals. The curriculum is mathematically rich, offering students opportunities to learn important mathematical concepts and procedures with understanding. Technology is an essential component of the environment. Students confidently engage in complex mathematical tasks chosen carefully by teachers. They draw on knowledge from a wide variety of mathematical topics, sometimes approaching the same problem from different mathematical perspectives or representing the mathematics in different ways until they find methods that enable them to make progress. Teachers help students make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures. Students are flexible and resourceful problem solvers. Alone or in groups and with access to technology, they work productively and reflectively, with the skilled guidance of their teachers. Orally and in writing, students communicate their ideas and results effectively. They value mathematics and engage actively in learning it.
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> (*Principles and Standards*, p. 3)

This statement, which opens the *Principles and Standards for School Mathematics* (NCTM 2000), summarizes the vision and ambitious goals for mathematics educators put forth by the National Council of Teachers of Mathematics. It also summarizes the focus of this course. MSED 511 is an advanced methods course for experienced teachers. It is at the core of the graduate program in mathematics education. The course helps students, who are already experienced teachers, to examine contemporary goals for both teachers and learners; to evaluate and modify their teaching practices in the light of those goals; and to develop a philosophy of mathematics instruction informed by modern learning theories and contemporary recommendations for mathematics curricula and instruction. Students will examine the role of conceptual learning and higher-order thinking skills in mathematics; develop their personal abilities to think mathematically; explore strategies for developing mathematical thinking in the classroom; and identify alternatives for attaining the various goals of contemporary mathematics education.

The course will focus on (1) improving your own mathematical reasoning ability; (2) exploring strategies to assist your own students, at whatever level you teach, to develop their mathematical reasoning and understanding; and (3) examining the connectedness of mathematical concepts and abilities as they evolve across the grades, K-12+.

Texts:

Stiff, Lee V. (editor). *Developing Mathematical Reasoing in Grades K-12*. 1999 Yearbook of the National Council of Teachers of Mathematics. Reston, VA: NCTM, 1999.

Stein, Mary Kay, Margaret Schwan Smith, Mrjorie A. Henningsen, and Edward A. Silver. *Implementing Standards-Based Mathematics Instruction: A Casebook for Professional Development*. New York: Teachers College Press, 2000.

Additional Reference:

National Council of Teachers of Mathematics. *Principles and Standards for School Mathematics*. Reston, VA: NCTM, 2000.

Assignments and class activities:

1. Attend all classes and participate actively in class discussions and activities.
2. Complete all assigned readings and prepare to actively engage in discussion following the readings. Students will be expected to assume responsibility for leading the discussion following selected reading assignments. Reading assignments are to be completed PRIOR TO CLASS on the indicated date. (See separate list of reading assignments.)
3. Participate in group projects that will be assigned and explained in class.
4. Complete problems or activities assigned in class and pay special attention to the development of your own mathematical reasoning as you work on the assigned problems.
5. Complete a final project as assigned in class.

Grading:

Grading is on an A-F scale. Grades are based on active participation in class activities, knowledgeable discussion of assigned readings, completion of assignments, presentations to the class, and completion of the final course project.

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability services in the Disability Services Office at 1104 University Center (227-1737). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and university guidelines.