

MA534 Methods of Teaching Secondary School Mathematics

Syllabus

Instructor: Joseph William Spadano

Course Description:(3 Credits)

In this course students study and practice the teaching activities of the potential mathematics teacher within the framework of the NCTM *Principles and Standards of School Mathematics*. Topics include the secondary mathematics curriculum, goals and objectives of instruction, planning and conducting mathematics instruction, history of mathematics education in the USA, assessment, and use of mathematical resources including those on the internet. Students will become familiar with and use as resources state, regional, and national professional journals. (Offered fall, alternate years.)

Learning Outcomes:

Students will be able to demonstrate knowledge, skills and behaviors in teaching secondary mathematics by:

- Developing an understanding of the theoretical relationships between curriculum, pedagogy, and belief systems within a problem solving educational orientation;

- Navigating the problem solving process through extended learning experience;

- Designing and presenting learning experiences that integrate problem solving and learning theory into the curriculum;

- Developing an understanding of the natural order of reasoning and logical within a problem solving educational orientation;

- Observing professional teaching mathematics and reflecting upon the science of education;

- Producing and presenting learning experiences that set forth a vision consistent with national reform initiatives, e.g., incorporating technology and cooperative learning.

Course Requirements:

Students will demonstrate knowledge, skills and behaviors in teaching secondary mathematics through a variety of spoken and written response which will include classroom activities, homework, a journal, a research paper, comprehensive tests, and the design and delivery of mathematical lessons that incorporate problem solving and learning theory.

The name of this course is interactive. Active involvement includes discussion and mastery of tasks and learning outcomes related to the purposes, goals, and objectives of this course. Students will examine, critique, and revise their own work as well as the work of the others. Therefore students are expected to active participants and attend all classes.(15%)

Homework is assigned regularly and must be done accurately and completely in an organized manner that is easily readable and mathematically rational.(10%)

A journal will provide students with the opportunity to reflect upon observations of secondary mathematics classes. The journal should demonstrate the student's ability to critically evaluate issues related to teaching mathematics. The journal must include observations of at least three different teachers. (15%)

A research paper will provide students with the opportunities to review relevant philosophical issues. The report should be indicative of academic scholarship and demonstrate the students' ability to analyze, synthesize, and convey a topic or theory. The paper must be six to ten pages and include at least six resources. (20%)

Comprehensive tests will measure students critical and creative thinking as it relates to the analysis and synthesis of the knowledge, skills, and behaviors in teaching secondary mathematics.(20%)

Each student will design and present four mathematical lessons. Each lesson plan should include, but is not limited to, the identification of intended audiences, a list of necessary materials, a purpose statement, objectives, and an evaluate scheme. The learning experiences should address multiple learning styles

and be consistent with the National Council of Teachers of Mathematics' vision of achieving mathematical power. (20%)

Methodology and Course Outlines:

A variety of teaching styles(e.g. direct instruction, independent and cooperative group work, or student presentations) will be used to engage multiple learning styles.

08.29 Survey and Interest Inventory. Introductions, Curriculum, Pedagogy, and Belief Systems. Educational Orientations. Problem solving Frameworks. Coordinate Geometry.

09.05 Homework Model. Isolating Points of Confusion. Learner-Centered Mathematics. Solutions presented by students. Reasoning, Thinking, and Problem Solving. Theory into Practice: Figurative Numbers.

09.12 Solutions presented by students. Understanding Teaching. Technology in the Mathematics Classroom: Geometry Inventor through" predict, observe, and explain" model.

09.19 Cooperative Learning. Poster Activity. Theory into Practice: Decomposing and Recombining Learning Experience.

09.26 Comprehensive Test: Midterm.

10.03. Multiple intelligences. Differentiated Instruction. Bernice McCarthy's 4MAT Framework. Theory into Practice: Inscribed Rectangle. Learner-centered Mathematics.

10.10 The mathematics of Change. A lesson on Geometry Probability. Manipulative and Tools. Topics in Mathematics Education.

10.17 Models of Probability. A lesson on Geometric Probability. Manipulatives and Tools.

Reading List/Resource:

Balacheff, N. (1990). Towards a problematique for research on mathematics teaching.

Journal for Research in Mathematics Education, 21. (4), 258-272.

Case, R. and Bereiter, C. (1984). From behaviorism to cognitive development. Instructional Science, 13, 141-158.

Davis. R.B. (1984) Learning mathematics: The cognitive science approach to mathematics education. Norwood, N.J.: Ablex.

Dewey, J. (1963) Experience and education. New York: P.F.Collier

Lampert, M. (1983). Frames of mind: The Theory of multiple intelligences. New York: Basic Books.

Lampert, M, (1986) Knowing, doing, and teaching mathematics. Cognition and Instruction, 3, 305-342.

Mayer, R.E. (1992) Thinking, Problem Solving, cognition. New York: Freeman

NCTM(1980) An agenda for action: Recommendations for school mathematics in the 1980's. Reston, VA

NCTM(1989) Curriculum and evaluation standards for school mathematics. Reston, VA.

NCTM(1991) Professional standards for teaching mathematics. Reston, VA.

NCTM(1995) Assessment standards for school mathematics. Reston, VA.

Polya, G. (1988). How to solve it: A new mathematical method. Princeton, N.J.: Princeton University Press.

Schoenfeld, A.H.(1985) Mathematical Problem Solving. San Diego: Academic Press Inc.

Schoenfeld, A.H.(1987) Cognition science and mathematics education. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Schubert, W.H. (1986). Curriculum: Perspective, paradigm, and possibility. New York: macmillan.

Vygotsky, L.s. (1962). Thought and Language. Cambridge, MA: MIT Press.