Millersville University
Math 405
The Teaching of Mathematics in Secondary Schools, 5 credits

Course Description:

An investigation into the current content materials, learning processes, pedagogical methods, assessment strategies and technological tools associated with the teaching of mathematics in secondary schools. Students will examine the implications of the PA Department of Education Mathematics *Standards* and the NCTM *Principles and Standards for School Mathematics* on teaching mathematics in secondary schools. Included in the course requirements are at least four mini-teaching experiences at local urban , suburban and rural middle schools and high schools. This course must be taken simultaneously with EDSE 321. This course should be taken the semester preceding student teaching.

Prerequisite: A grade of C or better in the following courses: Abstract Algebra (MATH 345), Introduction to Probability and Statistics (MATH 333), and either Survey of Geometry (MATH 353) or Transformational Geometry (MATH 355).

Course Objectives: Students will be able to

- Demonstrate broad and deep conceptual knowledge base of secondary mathematics content,
- Demonstrate the connections between undergraduate mathematics and secondary mathematics content,
- Demonstrate strong problem solving and reasoning skills,
- Demonstrate good written and verbal communication skills,
- Demonstrate the use of various pedagogical options and the knowledge of the curricular situations in which each option can be effectively used,
- Demonstrate the use of both physical and technological tools and the knowledge of the curricular situations in which each tool can be effectively used,
- Design lesson plans and unit plans which promote the learning of the conceptual knowledge of mathematical ideas in the secondary mathematics curriculum,
- Design lesson plans and unit plans which are creative and place the teacher as the guide /facilitator for student learning.

MU Conceptual Framework: All members of the Millersville University's Professional Education Unit will create learning communities of inquiry and action, focus on students, and demonstrate exemplary professional practices.

1. *Learning Communities of Inquiry and Action:* We will engage in learning communities in which reflection, collaboration, lifelong learning, and habits of mind are developed and nurtured.
2. *Focus on Students:* We will balance knowledge and the principles and concepts delineated in professional and state standards with an appreciation of all students' individuality, diversity, and cultures.
3. *Exemplary Professional Practices:* We will demonstrate the knowledge, skills, and dispositions of exemplary professionals. We will have strong competence in our content knowledge, pedagogical content knowledge and skills as delineated in professional, state, and institutional standards. We will demonstrate professional dispositions or standards of conduct, will be supportive of students, families, and the school and community, and will serve as catalysts for positive and responsible change.

Course Outline:

A. Content Strands in the secondary math curriculum
    1. Number Systems and Measurement
    2. Algebra: Patterns and Functions
    3. Geometry and Trigonometry
    4. Statistics and Probability
    5. Discrete Mathematics
    6. Foundations of Calculus
B. Learning Processes
    1. Problem Solving: Mathematical Modeling
    2. Reasoning and Proof
    3. Communication
    4. Connections
    5. Representation
C. Pedagogical methods
    1. Presentation/Lecture
    2. Cooperative learning models
    3. Guided Discovery
    4. Socratic Method
D. Effective classroom management strategies
E. Planning for Instruction
    1. Writing lesson plans
    2. Writing unit plans

F. Assessment Strategies
    1. Assessing conceptual and procedural knowledge in quizzes and tests
    2. Performance assessment tasks
    3. Alternative assessment strategies

G. Effective use of physical and technological tools in teaching mathematics
    1. Math manipulatives [fraction strips, algebra tiles, MIRA, etc]
    2. Graphing calculator/computer software as an instructional tool

Assessment Tools: Assessment of student learning in this course may consist of the following activities: student presentations, interviews, designing lesson plans and unit plans, as well as several mini-teaching experiences in local secondary schools and a final.

Required Materials: There is no required text for this course. However, the instructor cites information from the following references:

Principles and Standards for School Mathematics (2000). NCTM.

Curriculum and Evaluation Standards for School Mathematics (1989). NCTM.

Professional Standards for Teaching Mathematics (1991). NCTM.

Assessment Standards for School Mathematics (1995). NCTM.

Johnson, D.R. (1982). Every Minute Counts – Making Your Math Class Work. Dale Seymour Publications.

Johnson, D.R. (1986). Making Minutes Count Even More – A Sequel to Every Minute Counts. Dale Seymour Publications.

Johnson, D.R. (1994). Motivation Counts – Teaching Techniques that Work. Dale Seymour Publications.

Skemp, R. (1987). The Psychology of Learning Mathematics (expanded edition). LEA.