Course Outline

Department of Mathematics and Statistics

Minnesota State University, Mankato

Math 483 Advanced Viewpoint of 5-8 School Mathematics (3 semester hours)

Course Description: Advanced viewpoint of mathematics content and learning theories, teaching strategies, reading strategies, assessments, and planning, teaching and reflecting on grades 5-8 mathematics. Field experiences in grades 5-8 mathematics classroom required.

Prerequisites: MATH 290 with "C" (2.0) or better or consent

Learning Outcomes:

Student will be able to

1. Demonstrate an advanced viewpoint of mathematics topics of grades 5-8.
2. Demonstrate an understanding of the relation of cognitive theories of mathematics learning with instructional and curriculum decisions.
3. Demonstrate familiarity with and incorporate into instructional and curriculum decisions/reflections the recommendations and guidelines of professional groups.
4. Use appropriate instructional strategies and materials, including physical models and technology, in teaching 5-8 mathematics.
5. Construct, critique, and/or teach daily lesson plans in mathematics, demonstrating effective classroom management skills in mathematics; and, realistic and authentic assessment and evaluation of students and instruction.

Content Outline:

1. Mathematics topics from an advanced viewpoint:
   Proportionality
   Measurement in 2 and 3 dimensions and scaling
   Spatial visualization
   Data analysis
   Real numbers (number sense, models, operations, and properties).
2. Cognitive/research bases of mathematical learning:
   Algebraic thinking/cognitive obstacles research
   Van Hieles' model of geometric thinking at levels 1 and 2
   Piaget's cognitive level IIB as the transition from concrete operational thinking to formal operational thinking with a focus on proportionality and multiplicative schema
   Dienes' theory of structured games and representational variability in mathematics learning
3. Professional recommendations/guidelines
   NCTM Principles and Standards for 5-8 school mathematics
   Minnesota Graduation Standards for 5-8 Mathematics, the Basic Skills Test in Mathematics, and the 5-8 Mathematics Standards
4. Instructional strategies and materials

Reading mathematics - Skills, literature and readability measures
Mathematics discourse
Multiculturalism and gender fairness in mathematics classrooms
Physical models in teaching mathematics, such as Algebra Tiles, Decimal Grids, Paper Folding, Miras, Geoboards.

5. Planning, teaching and reflecting on mathematics lessons for grades 5-8
Constructing materials, lesson plans, student assessments, reflection papers and videotapes of self teaching lessons.
Observing and analyzing traditional and integrated (NSF funded) curriculum materials.
Microteaching 5-8 mathematics lessons to peers and students in grades 5-8.

Related Readings / Textbook / Materials:

Cangelosi, J. S. *Teaching Mathematics in Secondary and Middle School, An Interactive Approach* (Third Edition), Merrill, 2002.
Crouse, R. and Sloyer, C. *Mathematical Questions from the Classroom*
Leutzinger, L., (ed.) *Mathematics in the Middle*, National Council of Teachers of Mathematics and National Middle School Association, 1998.
Making Every Minute Count
MathLand and *MathScape*, Creative Publications (Curriculum materials for grades 5-8)
MathThematics, McDougal Littell, 1999 (Curriculum materials for grades 6-8)
Michigan State University, *Connected Mathematics*, Dale Seymour Publications, 1998 (Curriculum materials for grades 6-8)
Minnesota Mathematics Standards for Profile of Learning
National Council of Teachers of Mathematics (2003), *Principles and Standards for School Mathematics*
National Council of Teachers of Mathematics, Various Yearbooks
New Faces in Mathematics, NCTM, 1999
Rubenstein, Beckmann, & Thompson, *Teaching and Learning Middle Grades Mathematics*
Lappan (2nd Edition), *Comparing & Scaling -- Student Edition*
SciMath-MN, *SciMath-MN Minnesota K-12 Mathematics Framework*
Sobel, M. and Maletsky, E. *Teaching Mathematics, A Source Book of Aids, Activities and Strategies*
Steen, *On the Shoulders of Giants*
University of Wisconsin-Madison and the University of Utrecht, *Mathematics in Context*, Britannica, 1998 (A mathematics curriculum for the middle grades)