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:**

Crouse, R. and Sloyer, C. *Mathematical Questions from the Classroom*

*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)
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*
Sobel, M. and Maletsky, E. *Teaching Mathematics, A Source Book of Aids, Activities and Strategies*
Steen, *On the Shoulders of Giants*