



Mathematics in the Secondary School Math 416 Fall 2007 Syllabus

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Required Text and software license:

Teaching Secondary and Middle School Mathematics 2nd Edition by Daniel Brahier LiveText

Required Supplies

Three ring binder, notebook, & graphing calculator (you may borrow a TI-83 from Professor Harms if you do not own one)

Course Description:

Objectives, methods, materials, and evaluation of teaching mathematics in grades 9-12.

Prerequisites: Secondary Math Education Major with Junior or Senior standing who has been admitted into Teacher Education.

Course Objectives:

- 1) Formulate a personal sense of what is mathematics and what it means to teach mathematics.
- 2) Plan lessons that involve thoughtful questioning while balancing styles of presentation.
- 3) Create assessments that will be used to evaluate students understanding.
- 4) Become competent in appropriate uses of technology in teaching.
- 5) Practice equity of instruction through applicable modifications of lessons.

Class Expectations:

Regular and active classroom participation

Students will take on teaching responsibilities through class presentations, tutoring, and discussions.

Please turn off cell phones in class

Students will act in an honest and trustworthy manner in class and on all assignments. 20 hours of tutoring in the Math Learning Center

Complete The Math Forum mentor training, reply to student October problem submissions, and meet monthly with area students

Class Expectations continued:

MSUM's standard is that one semester credit hour for undergraduates is meant to represent three hours of academic work per week for the average student who has the expected preparation for the courses that he or she is enrolled in. Since this is a 3-credit course, that means that you will be expected to work 9 hours per week, on average, for this course. Only two and a half hours will be in class. Spending time reading the book, doing homework, tutoring, and preparing for lessons is meant to be a significant part of this course.

Course Activities:

Cooperative learning, integration of technology, and assessment of mathematical knowledge will be used in the teaching of this course by the instructor as well as the students during their lesson presentations. Students will include National Council of Teachers of Mathematics Standards (NCTM) or MN/ND Mathematics Standards in lesson and unit planning.

Evaluation:

- o Book and supplementary assignments 5-10 pts. each
- Lesson Plans 10 pts. each
- Lessons taught & reflections submitted-15 pts. each
- Unit plan (outlining the objectives, assignments, creating at least 2 assessments, & the identification of modifications for a students with disabilities) 40 pts.
- Tutoring log 25 pts.
- Tutoring reflection paper 20 pts.
- Teaching Handbook 28 pts.
- Final Exam 25 pts. Dec. 13th at 9:00

(Late work will lose 50% of its value each weekday unless prior arrangements have been made)

Grading Scale:

100-95 A; 94-93 A-; 92-91 B+; 90-87 B; 86-85 B-; 84-83 C+; 82-79 C; 78-77 C-; 76-75 D+; 74-72 D; 71-70 D-;

Reference Texts:

<u>Guidelines for the Tutor of Mathematics</u>, Laughlin, C., and Kepner, H., NCTM, 2001 (on reserve in the Library for 2 hr check out)

Every Minutes Counts, Johnson, D., Dale Seymour Publications, 1986.

Making Minutes Count Even More, Johnson, D., Dale Seymour Publications, 1986.

Motivation Counts: Teaching Techniques that Work, Johnson, D., Dale Seymour Publications, 1994.

<u>The Write Equation: Writing in the Mathematics Classroom</u>, Carter, J., Carter, D., Johnson, D., Dale Seymour Publications, 1994.

<u>Principals and Math Standards for School Mathematics</u>, National Council of Teachers of Mathematics, 2000. <u>http://Math Standards.nctm.org/</u>

Minnesota K-12 Academic Standards in Mathematics

http://education.state.mn.us/mde/Academic Excellence/Academic Standards/Mathematics/index.html

Minnesota K-12 Mathematics Framework This is on the web at:

http://www.scimathmn.org/frameworks_title.htm

Teaching Handbook - First drafts 6 pts/assignment and final draft 10 pts. These are to be placed in your LiveText drop box as Word Files.

- Tutoring Goals-Read <u>Guidelines for the Tutor of Mathematics</u> on reserve MAT-476 Due on Sept. 4th { StEP 6H}
 - What are the most important communication skills for tutors that are mentioned in this book?
 - What are the most relevant comments to you regarding being prepared to tutor?
 - List at least two questions you will regularly ask students as you tutor.
- Your first day of School Handout with the following –Sept. 11th {StEP 5C}
 - Goals for the class
 - Guidelines for student behavior and consequences of misbehavior
 - Grading philosophy
 - Calculator and computer policy
- Working with students of different abilities to prove that the sum of the interior angles of a pentagon is 540° Nov. 6th {Math Standards 3I1 K,P,A; 3I8 K; StEP 7F}
 - What are a teacher's responsibilities when a student has an IEP in math that he/she is two grade levels above classmates?
 - What accommodations would you make for students with a specified learning disability?
- Final Handbook –Nov. 29th {Math Standards 3I8 K,P,A}
 - Revised drafts of the three assignments listed above following recommendations made.
 - At least 2 lesson plans along with a 1-2 paragraph explanation describing how you would modify the lesson for students with low reading abilities to succeed in each lesson.

High School Math Unit Plan & Assessment {Math Standards 3G4b K,P,A; 3I3

K,P,A; StEP 1E, 1J, 7D, 8A}

Unit Plan should contain 3-4 weeks worth of:

- o Daily student performance objectives (5 pts)
- Brief descriptions of the instructional strategies and methods for the activities in class (5 pts)
- Identify the textbook and at least 3 supplements you would include such as problems from other books, worksheets, or websites that make connections between the mathematics being studied and other disciplines. (5 pts)
- o List Daily homework (5 pts)

& <u>Assessment(s)</u>— In the form of at least two quizzes <u>and</u> one test.

- Incorporates the daily objectives along with the MN graduation standards (5 pts)
- Questions clearly and correctly <u>phrased</u>, properly <u>formatted</u>, with a reasonable length of time allotted, point values <u>assigned</u>, and adequate <u>space</u> provided for work (10 pts)
- <u>Solution</u> keys that include worked out assessments (5 pts)

Pre-service teachers will solve **The Math Forum** Problems of the Week, mentor replies to student problem submissions, and meet monthly with area secondary students. {Math Standards 3A1 K,P,A; 3A3 K,P,A; 3C3 K,P,A; 3G1 a-d K,P,A; 3G2b K,P,A; 3H3c K,P,A; 3I9 K,P,A; StEP 1I}

While working with elementary/intermediate algebra students in **Math Learning Center** pre-service will be prepared to assist students by working the labs prior to the lesson and actively question students to determine their level of understanding{Math Standards 3C1-C5 P,A; StEP 8F}

Tutoring Reflection {Math Standards 3I1&2 K,P,A; StEP 9E & 9H}

Answer the following questions:

- You had listed two questions in your first tutoring log that you were regularly going to ask students as you tutored. Did you do this, if so how well did this help students better understand the problems? When you are teaching, what questioning will you incorporate?
- How did your work in the MLC prepare you to become a better teacher? (What learning difficulties did students encounter and how will you address when you are teaching these?)
- How will you take your experience with The Math Forum's POW into your teaching? Describe in detail and provide relevant examples.
- Overall, identify any suggestions or recommendations that would make these experiences more beneficial?

Lesson plan for a high school math class {Math Standards 3G3a-c K,P,A; StEP 1E}

- 1. OBJECTIVES / Intended, Observable Outcomes
- 2. MATERIALS / Visual Aids
- 3. READINESS / Prior Knowledge and Skills Required
- 4. MOTIVATION / Anticipatory Set / Advanced Organizers / Introduction Include anticipated Time for each section
- 5. PROCEDURE / Instructional Strategies / Activities/Key Questions

This part of planning a lesson will vary depending on the material taught.

Subsets may include: Modeling / Demonstration / Examples

Checks for Understanding / Procedural Checks Guided Practice Reinforcement / Corrective feedback Diagnostic Testing Remediation / Follow-up Closure / Testing Assignment

- 6. MODIFICATIONS / Considerations of Objectives, Methods and/or Math Standards of "Success" for Special Needs Students.
- 7. ASSESSMENT / Methods of Evaluating Student Learning
- 8. IF TIME / Extension or Enrichment Activities
- 9. EVALUATION

Subsets may include: Pre- Lesson Check List

Post-Lesson Evaluation of Teaching/Instructional

Post-Lesson Evaluation: Objectives/Methods/Assessment

10. SOURCES /References of Ideas

In addition to using a textbook you should use at least two more sources, one print and the other electronic.

Lesson presentation of a high school level math topic {Math Standards 3G4c K,P,A;

3I5 K; StEP 1C }

- Turn in a copy of your lesson plan before you teach
- Professional Dress and Behavior
- Motivational activity that makes connections between mathematics and daily living
- Asks questions throughout the lesson from a variety of cognitive domains
- Content presented clearly & correctly (speech in loud and articulate, writing is legible and large, statements are mathematically correct)
- Lesson Reflection completed within 2 class periods of the lesson presented

Lesson presentation of a college level math topic {Math Standards 3G4a K,P,A;

Capstone assignment}

- Select one of the Mathematics Content Knowledge strand from Praxis II
- Create a Power Point slide with at least 7 slides on this topic
- Demonstrate the interconnectedness of the concepts and procedures of mathematics
- Type up practice problems and their solutions
- Record your lesson using Tegrity/Camtasia/Captive
- Watch and reflect on your lesson within 2 class periods of the lesson presented

Readings and Textbook Questions:

Chapter 1– Mathematics as a Process {Math Standards 3H1-2 K; StEP 1D} Questions 1, 6, 7 on p. 26 Read Guidelines for the Tutor of Mathematics Chapter 2 – Learning Theories and Psychology in Mathematics Education {StEP 7A} Questions 3, 4, 5, 7, 9 on p. 58 Chapter 3 – Curricular Models {Math Standards 3I4 K,P,A} Questions 2, 5, 7 on p. 85 Chapter 4 – Implementing a Course of Study {Math Standards 3I3 K,P,A; StEP 1G, 4A} Questions 1, 4, 5, 7, 8, 9 12 on p. 115-116 Chapter 5 – Planning for Instruction {Math Standards 3G4d K,P,A} Questions 1, 3, 6, 8, on p. 153 Chapter 6 – Teaching Tools and Strategies – Geometric and Polar representations of complex numbers {Math Standards 3C6 K,P,A; 3H4 K,P,A} Questions 1, 3, 5, 10 on p. 191 Read the art of questioning in Every Minute Counts, by Johnson, D. Chapter 7 – Teaching Specific Mathematics Content – The study of Discrete Mathematics-Fractals and Matrices {Math Standards 3B6 P,A; 3C8, K,P,A} Questions 3, 6, 7 on pp. 237-238 Chapter 8 – The Role of Assessment {StEP 2E, 8B, 8D} Questions 1, 2, 3, 5, 8, 9, 10 on p. 275 Read and respond to the Assessment Handout Chapter 9 – Principles of Assessment Practices {StEP 4A, 8C, 8E} Questions 1, 2, 4, 5, 6, 8 on pp. 302-303 Chapter 10 – Meeting the Needs of All Students {Math Standards 3I8 K, StEP 3B} Questions 1, 2, 4, 9 on p. 329 Chapter 11 – The Teacher of Mathematics in the School Community {Math Standards 3I7 K,P,A;

3I5-6 K; StEP 9K & 10A} Review <u>http://www.revisor.leg.state.mn.us/arule/8700/7500.html</u> Questions 2, 6, 8, 10, 11 on pp. 355-356 The Math Standards are the MN Board of Teaching Standards 8710.4600 as of 7/27/05 StEP are the MN Standards of Effective Practice for Teachers *as of 04/24/06*.

CONCEPTUAL FRAMEWORK OF THE MSUM TEACHER EDUCATION UNIT

MSUM candidates are professionals who are knowledgeable, reflective, humanistic, and creative.

Knowledgeable: MSUM candidates display competence in their subject matter, built upon a strong grounding in liberal studies. MSUM candidates understand the principles of learning, assessment and technology. They understand and apply legal and ethical considerations to all aspects of their work. MSUM candidates are able to integrate theory and practice, and view learning as an active process. MSUM candidates demonstrate the ability to model connections between philosophical foundations and best practices in the field. As life-long learners, MSUM candidates engage in research and complex thinking. They design opportunities for others to seek knowledge and to understand themselves as members of the world community.

Reflective: MSUM candidates engage in thoughtful analysis of the meaning and significance of their actions, decisions, and results with regard to their work in order to assess progress in meeting this guiding principle. It is through this reflective process that candidates improve instruction, implement new ideas, abandon ineffective methodologies, and enhance learning outcomes for their students. MSUM candidates are skilled at analyzing their teaching from a variety of perspectives and identifying connections between teaching strategies and student learning. In addition, candidates utilize a variety of techniques to question their procedures and consider alternatives for instruction and student growth. MSUM candidates recognize learning, motivational, and developmental variables and relate those dimensions to their teaching practices. Finally, MSUM candidates bring a questioning spirit to received wisdom and conventional practice when needed.

Humanistic: MSUM candidates value the personal worth of each individual. This is based on a belief in people's potential and innate ability to develop to their fullest. MSUM candidates' actions are grounded in knowledge of different cultural and ethnic groups within the world community, and in knowledge of the influence of culture and history, ethnicity, language, gender and socio-economics on one's life. This knowledge base informs candidates' decisionmaking as they create environments that promote freedom, compassion, and success for all learners. MSUM candidates are fair-minded in their interactions with others, as well as sensitive to and accepting of individual differences. Further, MSUM candidates have an understanding of aesthetics and the diversity that is part of the human experience and will incorporate this knowledge into their work. MSUM candidates recognize and accommodate a variety of linguistic and nonlinguistic interpersonal skills in their actions with others. MSUM candidates foster resiliency in the students with whom they work and model these qualities in their own work.

Creative: MSUM candidates understand the powerful resources of the arts and sciences and use their knowledge of these areas to bring the best of their imaginative and creative acts into the classroom. MSUM candidates recognize the important role creativity plays in the design of instruction and classroom environment. They will, for themselves and for their students, meet new situations with resourcefulness, excitement and curiosity, with an investigative attitude, and with the ability to pose, seek and design solutions to problems. MSUM candidates are cognizant of the aesthetic elements of the world and draw on that knowledge to make curricular decisions designed to help students not only learn about aesthetics, but to also learn how to think about the world at large.