

MAT 305/MAT 500
Mathematics for Secondary School Teachers
Fall 2014

Wednesdays, 4pm-6:30pm
108 Neville Hall

Instructor:

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Office hours: TR 10:30-11:30 am, W 1:30-2:30 pm and by appointment

Course goals

The broad goals of this course are to:

- (a) prepare students to take on the varied responsibilities of being secondary school mathematics teachers, and
- (b) develop the knowledge and skills necessary to continue to develop as teachers in the future.

The first goal is focused on NOW (the teaching-related tasks you have this semester) or SOON (the responsibilities you will have when student teaching in a subsequent semester). The second is about FOREVER (your continued learning and development as a teacher of mathematics over the course of your career).

As examples of the way that the NOW/SOON and FOREVER complement each other, the course has been designed to help you:

- *begin* to develop a deeper understanding of the school mathematics curriculum and *become* a lifelong explorer of the mathematics you are teaching
- *begin* to develop a comfortable and workable teaching persona and *become* a professional who has strategies to keep evolving as a teacher
- *begin* to be a thoughtful questioner and active listener, comfortable enough to focus on your students as well as on your own performance, and *become* a reflective critic of your own actions, sensitive to important problems of teaching

More specifically, the goals of the course are to help students:

- Become familiar with a variety of approaches to mathematics instruction
- Enrich their knowledge of how students think and learn
- Become savvy consumers of mathematics education resources and research
- Develop skills for inquiring into and analyzing student thinking and learning
- Enhance their knowledge of mathematics and mathematical problem solving
- Enrich their understanding of connections between secondary mathematics content and more advanced mathematical ideas

Course activities

To accomplish the course goals, students will participate in a variety of in- and out-of-class activities. In particular, students will:

- Read articles and book chapters specifically about teaching methods for secondary mathematics
- Read articles and book chapters about research on student thinking and learning of particular mathematics content
- Participate in on-line and in-class discussions of readings and related ideas
- Complete a variety of investigations into how student think and learn
- Develop your own mathematical problem solving skills and knowledge

Course Blackboard site

Assignment descriptions, readings other than ones from the required texts, and various handouts from class will be available on the course Blackboard site. To access it, go to www.courses.maine.edu and login using the same username and password that you use for MaineStreet (not FirstClass). The Blackboard site is also where you will participate in discussions of course readings and where you will submit your written work on the course assignment. I will also use the email utility on the site to communicate with students in the course. It sends messages to your @maine.edu email account. Make sure to either check that account regularly or have messages sent to it forwarded to an account that you do check regularly. More details about the site and how to access and use it will be provided in class.

Assignments

The assignments are designed to help students reach the goals of the course as well as to address a variety of University of Maine *Proficiencies* for pre-service teachers. See table of proficiencies on the last page of this document.

Readings

There will be reading assignments for most classes. One goal of having assigned readings is for you to become familiar with methods-related and research-related literature. Another, equally important goal, is for you to become savvy consumers of such resources. Being a savvy consumer entails developing skills in locating, reading, analyzing, and critiquing articles.

Discussion forums

We will make use of the discussion forum feature on BlackBoard as a way of communicating about ideas in the readings prior to class. Details of this will be discussed in class but the basic idea is that you will post questions or comments about the readings prior to class and you will also reply to questions or comments posted by your classmates. This serves two purposes. First, it provides structure and focus for you as you read the assigned articles. Second, it gives me information about what ideas were of particular interest to the class and what questions or issues came up as people did the readings.

Course projects

There are four major projects that students will complete during the course:

Clinical Interviewing Project. In this project, you will have the opportunity to plan, conduct, and reflect on a clinical interview. The goal of this special type of interview is to get as good an understanding as possible of what someone knows and thinks about a particular mathematical idea. The central mathematical idea in this project will be transformational geometry as it pertains to the Common Core Standards. This project will provide you with very detailed information about students' thinking that is not always feasible to gather in the midst of classroom teaching but insights from such interviews and the types of questions used in them are tools that can be used in classroom instruction to obtain very valuable information about student thinking and to assess learning.

Unit Design Project. In this project, students will design a unit of instruction in mathematics, within the 9-12 grade span, consisting of three connected lessons that demonstrates your ability to plan a cohesive learning sequence. This unit should build on the Common Core State Standards, and use a variety of instructional approaches appropriate to the topic. Since this assignment is considered a key assessment for multiple InTaSC standard, your lessons should provide evidence that you can accomplish the following indicators (explicated here based upon UMaine proficiencies).

For Proficiency 1

Demonstrate a sufficient knowledge of content.

For Proficiency 3

Use rich knowledge of content to engage in planning lessons addressing key concepts and tools of inquiry and choosing appropriate teaching strategies.

For Proficiency 4

Within lessons, link the content to other disciplines and use the content knowledge to solve problems in these disciplines.

For Proficiency 5

Understand the need for planning instruction consistent with content knowledge, students' needs, and existing curricula, and develops a unit of instruction based on this understanding that references these sources and includes goals, objectives, assessments, instructional activities, and resource materials.

For Proficiency 6

Incorporate into a unit plan a variety of teaching strategies that meet different learning goals and student needs, and that vary teacher roles in the instructional process.

For Proficiency 9

Understand the need for planning instruction that engages students and motivates them to be active learners in the process and incorporates into the unit plan opportunities for this engagement to happen.

For Proficiency 15

Recognize the need to draw from educational research and scholarship to improve practice.

Assessment Project. You will be assigned a topic from the high school mathematics curriculum, as found in the Common Core State Standards. Your task is to design an assessment “instrument” that you believe will yield an accurate view of student learning in that area. At its core, your project should be consistent with what documents such as the PSSM Standards, and our text say assessment should look like. This includes, in part, attention to higher order thinking ability.

Technology Project. In this assignment, you will create an original lesson on some topic in the secondary curriculum with a central focus on the use of technology in that lesson. Note that the use of technology must be **fundamental** to the learning of the mathematics in the lesson and not merely *tangential* to it. I.e. do not plan a lesson and introduce technology into it merely for the sake of having technology present: your lesson goals should include some explanation about why the use of technology is crucial and/or necessary for your students to understand the math in the lesson. Acceptable forms of technology use include graphing calculators, computer algebra systems (CAS), dynamic geometry software, spreadsheets, manipulatives, or smart boards. NOTE: Again, the use of the smart board in the lesson must be fundamental to the learning of the mathematics involved, and not merely used as a presentation tool for the mathematics.

A note about late assignment submissions: Unless you receive approval from the instructor prior to the deadline, late assignments will be awarded a maximum of 80% of the possible points for the assignment.

Texts

Readings for the course will come from three sources:

1. Brahier, D., (2013). *Teaching Secondary and Middle School Mathematics*, 4th Edition, Pearson Education.
2. Kilpatrick, J., Martin, W. & Schifter, D. (Eds). (2003). *A Research Companion to Principles and Standards of School Mathematics*, Reston, VA: National Council of Teachers of Mathematics.

These are the **required** texts for the course. You may purchase print copies (from the bookstore or online) and an electronic version of the Brahier one is available for rent online through www.coursesmart.com.

3. Journals and books on mathematics instruction and research. These readings will be made available via the course Blackboard site.

Attendance

Attendance is mandatory. Absences other than for emergencies or cleared in advance may lower a final grade.

Online Resources

State of Maine Learning Results: www.state.me.us/education/Iresmain.htm

Principles and Standards for School Mathematics (NCTM) (2000), Reston, VA: www.nctm.org

Grading

Course Projects

Clinical Interviewing	15%
Assessment Project	15%
Technology Project	15%
Unit Design Project	25%

Discussion forum posts 15%

Smaller writing assignments & in class activities 15%

Academic Integrity

Academic dishonesty including cheating, plagiarism and all forms of misrepresentation in academic work, is unacceptable at the University of Maine. As stated in the University of Maine's online "Student Handbook," plagiarism (the submission of another's work without appropriate attribution) and cheating are violations of the University of Maine Student Conduct Code. An instructor who has probable cause or reason to believe a student has cheated or plagiarized may act upon such evidence and report the case to an Associate Dean.

You are encouraged to become familiar with the University's policies on academic honesty found in the Student Handbook. Copies of these policies may be obtained in the Library at the center for Student Services and online at <http://www.umaine.edu/handbook>. This course actively supports these policies.

Accommodations:

If you have a disability for which you may be requesting an accommodation, please contact Ann Smith, Coordinator of Services for Students with Disabilities (Onward Building, 581-2319) as early as possible in the term and then provide the course instructor with the appropriate documentation and information about accommodations.

Mathematics Education Research

Materials gathered as part of regular classroom activities (lecture, online discussions, etc.) may be used for research purposes. Data will have identifying information removed prior to publication or public presentation to protect students' identities. Allowing or disallowing the inclusion of materials for research purposes will have no impact on your grade. Data include any of the following, which are part of normal classroom activities: projects, classroom tasks, and online discussions. These data may come from graded elements of the course, but the collection of the data will not affect your grade. If at any time you would like to opt out of having your materials used for research purposes please contact Billy Jackson (jackson@math.umaine.edu).

UMaine Candidate Proficiency	Maine Standards for Initial Teacher Certification (MSITC)	Interstate Teacher Assessment and Support Consortium (InTASC)
1	1(a) - demonstrates knowledge of the central concepts, tools of inquiry, and structures of the discipline(s) s/he teaches	4 (a) - Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches
2 – For other school professions	UMaine - knows their fields and can explain principles and concepts delineated in professional, state, and institutional standards	None
3	1 (b) - can create learning experiences that make these aspects of subject matter meaningful to students	4 (b) - Content Knowledge. The teacher creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content
4	2 - demonstrates the ability to integrate the concepts, tools of inquiry, and structures among the disciplines	5 - Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues
5	4 - plans instruction based upon knowledge of subject matter, students, and curriculum goals	7 - Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context
6	5 (a) - understands and uses a variety of instructional strategies	8 - Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways
7	5 (b) - understands and uses a variety of appropriate technologies	(See ISTE NETS-T standards)
8	3 - demonstrates knowledge of the diverse ways in which students develop and learn by providing learning opportunities that support students' intellectual, physical, emotional, and social development	1 - Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences
9	6 - creates and maintains a classroom environment which supports and encourages learning	3 - Learning Environments. The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self motivation
10	7 - demonstrates the ability to support students' learning and well being by engaging students, home, school, colleagues, and community	10 - Leadership and Collaboration. The teacher seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

11	9 - demonstrates an awareness of and commitment to ethical and legal responsibilities of a teacher	See candidate proficiency 14 (below)
12	10 - demonstrates a strong professional ethic and a desire to contribute to the education profession	See candidate proficiency 10 (above)
13	UMaine - Recognizes the individual and group differences in their students, families, and cultures, builds positive relationships and supportive interactions, and adjusts practice accordingly so that all students can learn	2 - Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards
14	UMaine - Demonstrates a commitment to reflecting on and seeking to improve practice	9 - Professional Learning and Ethical Practice. The teacher engages in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner
15	UMaine - Recognizes the need to draw from educational research and scholarship to improve practice	None
16	8 - understands and uses a variety of formal and informal assessment strategies to evaluate and support the development of the learner	6 - Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.
17	UMaine - Demonstrates the impact of his/her teaching on student learning	None
18	UMaine - Understands the policy contexts within which they work	None