

Teaching Secondary School Mathematics

MATH 4090

Fall 2007

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Class Meetings:
M, W, F 11:50 – 12:40 pm
LCB 215

Course website: <http://www.math.utah.edu/~emina/teaching/4090f07>

Office hours

M 1:30 – 3:00
WF 10:00 – 11:30
Other times **by appointment**

Required Materials

- NCTM Principles and Standards for School Mathematics
- Articles available through electronic reserves (link on WebCT site)

Course Description

This course is a crucial part of your professional preparation as a secondary mathematics teacher. The course will help you learn to carry out certain key activities that are part of the work of teaching mathematics. The course will also convey and help you develop a sense of what is valued in the profession that you are entering. A close contact with actual practice (your field experience) is important in this course and you should see course and field experience as two sides of the same coin. We expect the course will teach you how to practice the profession you have chosen, and that the placement will give you a context to begin to do that. Thus **we expect that you will see yourself as a teacher in both places rather than as a student here and an observer in school.**

This is a course on teaching mathematics (not just on teaching)—hence you should expect to use your mathematical background to design pedagogical approaches and even do some mathematical inquiry as part of your preparation to teach. It is understandable that sometimes you may not remember off the top of your head what a mathematical concept means or why a statement about a concept is true. As a teacher, however, you need to know your subject; that means you should be able and willing to find out answers to mathematical questions. Textbooks from high school (which you can find in the curriculum library in Marriot on the 1st floor) and our university libraries should help you find out answers to mathematical questions. Some internet sites like The Math Forum (<http://mathforum.org/>) can also help, but do not trust just anything off the internet.

The course has two fundamental purposes. On the one hand the course will help you learn how to do *some* of the **activities that are involved in teaching mathematics.** It takes a lot more than a person who likes children and who can do mathematics to make a mathematics teacher; like in any profession, there are a number of activities you need to learn how to do. On the other hand you will learn about what the profession of mathematics teacher is about. This includes learning about current recommendations and orientations for teaching school mathematics—what is considered good practice by the profession and

why, and what resources you can use to think critically and reflectively about the profession you have chosen. **We want to strike a balance between teaching you how to do things so that you feel competent as a beginning teacher and giving you a sense of where you should aim your teaching to be, so you can become a positive force in the teaching profession.**

The syllabus is oriented around what we call key activities of teaching mathematics. These are not all the things that mathematics teachers do—but a subset of those. We will concentrate on teaching you how to perform those activities that you should be concerned with at the beginning of your career and that are specific to mathematics. This semester we will focus on the following activities:

1. What kind of **mathematical work** should we expect students to do in our class and how can we teach them to do it and value it?
2. How can we **explain mathematical concepts and propositions** aiming for students' understanding?
3. How can we **explain procedures and skills** aiming for procedural fluency and strategic competence?
4. What are the uses of homework and how can we **use homework** as an opportunity for students to learn and for us **to find out what they learned**?
5. What is the value of **classroom discourse** and how do we **teach with students' participation**?
6. What is the value of **using problems as vehicles for teaching** new things and how does one do that?
7. In what areas do students need practice, how and when can we **provide practice**, and what can we do to support practice?
8. What is the value of **previewing and summarizing** what we teach and how does one preview or summarize a lesson or a unit?
9. What are the **outcomes** we should aim for, how do we create **instruments that assess** them, and how do we **score students' performance**?
10. What do we need to think about when we **plan a lesson or a unit** and how can we record that thinking to communicate it to others?
11. What **tools (technological and others) are available to use** in the mathematics class and how can we use them to teach the mathematics?

Across all of those activities that we will discuss, learn, and practice, there are two general, cross cutting themes. One of them is the need to use (and, actually, develop) our knowledge of the discipline of mathematics in order to teach mathematics for understanding. Your study of mathematics has hopefully prepared you to understand difficult mathematical ideas and to propose and solve interesting problems. You have also become aware of what it means to do mathematics and what mathematics is as a discipline. We expect you to use your knowledge of and skills in advanced mathematics (and not the least, your love of mathematics as well as of children) to look at how this beautiful discipline can be taught and to decipher what students think. From the perspective of a student majoring in mathematics in college, the ideas of school mathematics may look straightforward. Yet, to be able to teach those ideas in a way that honestly represents the nature and the value of the discipline, as something that makes sense, that can be understood and used, is not an easy task. This course will help you think about how mathematical ideas can be developed and used in school in ways that honestly represent the discipline of mathematics.

A second, general theme that pervades this course is to learn how to use the mathematics class as a place for the cultivation and public exercise of the intellect of all children. Part of what it means to be educated includes to be able to state one's point precisely, to assert one's right to think before committing an opinion, to argue one's point, as well as to listen to others, to be convinced if their argument is compelling, or if one disagrees to be able to know what it is that one disagrees with, etc. Part of what it means to learn to live in a democracy means that you learn to require and accept good reasons for doing

things, rather than submit to or exercise authoritarianism. Mathematics can be great training grounds for students to learn to rely on reason, a true instrument of democratization. But, sometimes it fails to serve that purpose... Many of those intellectual and civil qualities are at stake when we teach, and we need to learn how to foster them. How can we make our mathematics class into one that promotes intellectual diversity and that celebrates humanity at the same time that we teach the curriculum.

We expect that you will have lots of practical/personal questions of the sort of “how do you deal with X,” X being something like calculating a grade, breaking up a fight, or discouraging a student from going to the bathroom twice every single day. The best source for that kind of advice is your cooperating teacher. We encourage you to make use of your cooperating teacher for fielding those questions, and also observe carefully what kind of management problems appear in your class placements and how your cooperating teacher handles them. Specific questions about management you can also bring to our attention anytime (by sending an e-mail) and we can discuss them with the whole class.

We will also use this semester to get familiar with the middle and high school curricula. Each week you will read a strand of NCTM’s Principals and Standards for School Mathematics and part of your homework will be to comment on your reading. We will discuss the key activities of teaching through examples that will follow the standards. We will also look at Utah Core Curriculum and consider how we use each in our teaching.

Readings, experiences, discussions, practice, writing

The readings have been chosen to complement (extend) the material from classes and for you to **become familiar with the professional literature** from the field of mathematics teaching and learning. You are expected to read those articles and use them as you participate in class, for example when commenting on how a certain teaching activity could be done, or when giving feedback on the performance of such activity by a classmate. You will be asked to respond to some readings in writing: you should be able to summarize what the author says and what is their argument as well as explain in what specific ways you consider the article helpful to you as a teacher.

Every week we will be proposing some class assignments and related “homework.” You will be expected to **respond to those questions, sometimes in the form of brief essays** sharing your thoughts, **sometimes in the form of artifacts** that you create for teaching (e.g., scripts, worksheets, plans). As the semester progresses we expect you to use your opportunities for interaction with children and teachers in your field placement as well as the professional literature to come up with ideas to address the questions that we pose in class. This means that your writing should not just reflect your opinion but also draw on what authors say and be grounded on evidence you gather from school classrooms. As the semester progresses we anticipate you may want to revisit things that you wrote earlier, reflecting upon your writing, and elaborating on your thoughts.

Class work

We expect you **to come to every class on time, turn assignments when they are due, participate actively in classroom discussions and activities, and take notes**. Because you are preparing to be a teacher, your participation needs to reflect professional learning. This means that it should draw on the literature and on classroom experience and that it will not just be judged on the basis of its content but also on the basis of its form: You will need to speak audibly, connect with your audience, modulate the words you utter, and use standard English. We will give you feedback on what you say and on how you say it, in the understanding that it matters to you because so much of our work as teachers includes speaking for others to understand us. For the reason that you need to be prepared to think on your feet and talk in public you should expect to be called on even when you don’t volunteer. It is fair game (and deserves all our respect) if you ask for time to think about something or if you say, “I don’t know but here

is how I would find out.” For the same reason, we expect you will give us feedback when we speak in ways that are difficult to understand or to hear and that you will accept that at times we also need to regroup and think for a while.

We expect **you to ask questions**. There will be many and varied questions about mathematics teaching and learning as well as about more general aspects of teaching that will arise for you as you work at your school placement and as you engage with the course material. Some of those questions may not seem included in the syllabus—a way for you to ensure they get addressed is by asking them.

All assignments done at home and due on a given day should be submitted through WebCT. The file name should start with your first name and last initial and the assignment name, e.g. eminaa-hwk12 would be the 12th homework submitted by Emina Alibegovic. **Assignments and handouts will also be posted on the course website after each class—look in there for assigned readings and homework.** You are most welcome to provide feedback, written or oral, personal or anonymous. There is a link on the course website that will allow you to do any of those.

Grading

The grading is based on your performance on several aspects of the course.

I. Course Portfolio

As the semester goes by you will do readings and homework and you'll also have time to reflect on issues of teaching and learning mathematics in response to the course. You will also have had the chance to do various activities, write them up, and get feedback on your ideas. A list of mathematics problems will be given to you at the beginning of the semester with the expectation that you should be able to solve most of them. You will be asked to put together a portfolio with samples of your (revised) homework, syntheses of your readings, 15 solved mathematics problems, and written reflections on class work. The portfolio is worth 10 points of your grade (many of its parts will have been graded elsewhere). A rubric indicating explicitly what the portfolio should include will be handed out in the second class.

II. West High Project

The West High Project consists of a paper describing your activities of teaching and reporting on your reflection on three specific activities of teaching you are assigned to practice in your field placement. You will turn in the complete project before the last day of class. This project is worth 20 points of your grade. A rubric indicating what elements will be considered in assessing the paper will be handed out near mid-semester. More details will be provided shortly before you begin your observations.

III. Homework (20 points)

Incomplete homework or homework turned in late will still be commented on but gets no points. You should still improve incomplete or late homework and include it in portfolio.

IV. Lesson and Unit Plan (30 points)

You will prepare two formal lesson plans using ideas learned in the class. These plans should be **original** and have a minimum of material from other sources. They should be complete enough that other members of the class can use them with ease. Each lesson plan must include course, grade level, length of period and each of the following (as will be further detailed in class):

- a. Objectives and procedures
- b. Materials necessary
- c. Relationship to NCTM Standards and State Core

- d. Teaching and questioning strategies
- e. Related concepts
- f. Tool for assessment (not necessarily a test or quiz)

Unit Plan: (more details will follow)

You will develop a plan to teach a set of about 6 to 8 math lessons on a particular topic. Your unit will include:

- a. An overview of the unit that summarizes your goals, rationales and plans for assessment.
- b. A content inventory that outlines the mathematical ideas of the unit.
- c. A detailed opening lesson plan.
- d. Less-detailed lesson plans for 2 more key lessons (these can be the lessons you have already made for the lesson plan assignment)
- e. A library of lesson ideas that you will draw on for the follow-up lessons.

V. Class
(10 points)

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Assignment	Due Dates	Points
Homework assignments		20
Course portfolio	12/07	10
Lesson plan	10/19	15
Unit plan	11/16	15
Class presentations	10/5, 12/3	10
West High project	11/30	20
Attendance, interest, punctuality, participation		10
Total points		100

participation
value
attendance,
punctuality and
interest. Being
present every
class is

essential—you should avoid conflicts by scheduling every other activity outside this class time (including exams, scheduled doctor’s appointments, etc.). If an emergency requires you to miss class you should inform us ahead but the absence will be noted nevertheless. To earn these 10 points you must be present every class, be punctual, act and speak in a manner appropriate of a beginning professional, and demonstrate interest in the subject by being attentive and participating.

Electronic submissions: All assignments, including the Course portfolio, the West High project, and homework should be turned in electronically using WebCT. Homework should be posted before 11AM on the Friday for which the homework was assigned. Papers and portfolio are due by 11:59 PM on the day they are assigned. Make sure to submit those on time: WebCT does not accept late assignments. Label your files with your name and the kind of assignment it is (e.g., Johnson-HW#n.doc, Jones-Portfolio.doc, Jonestown-Paper1.doc, Jonahson-Student#1.pdf). **Please do not email assignments and try not to submit attachments using many files (e.g., your portfolio should be one Word document with many sections rather than many Word documents. If you are making your portfolio as a website or a blog submit a file with its web address).**

Grading scale and summary of graded assignments and deadlines

Letter Grades

According to the points accumulated by the end of the semester, you will be assigned a letter grade as follows

95-100	A	90-94	A-
85-89	B+	80-84	B
75-79	B-	70-74	C+
60-69	C	Below 60	Must retake course and may not student teach until earning a grade higher than C

In all of the assignments your performance will be assessed against a rubric and not in comparison with your classmates. This means that it is possible for everybody to make an A or for everybody to make a C.

Letter grades are given at the end of the semester. Individual assignments are given a numerical grade that represents the number of accumulated points toward the final grade. This means that a score of 8 in Paper 1 should not be interpreted as a B: it only means that you have secured 8 points and lost 2 of the 100 at stake, but you could still earn an A if your performance in other assignments is better.

ADA: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building, 581-5020 to make arrangements for accommodations. Please notify me at the **beginning** of the semester, so we can arrange accommodations.

<p>Holidays: Labor day: Sept. 3 Fall Break: Oct. 8 – 13 Thanksg: Nov. 22,23</p>	<p>Exams: Final: Dec 12, 10:30-12:30</p>	<p>Other dates: Drop day, 8/29 Withdraw day, 10/19 UCTM -- tba</p>
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