M321: Secondary School Mathematics Curriculum and Assessment
Syllabus, Spring Semester 2013

Instructor
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A little about me: I taught middle and high school students for 9 years in L.A. and outside of Chicago. Then for 2 years I was a mathematics assistant to teachers in an elementary school in Georgia. I have now taught prospective and in-service teachers in Georgia, Portland, Oregon, and Indiana. I love teaching students of all ages and look forward to working with you.

Class Times and Location
Mondays and Wednesdays 2:30 pm – 3:45 pm, ED 3017

Office Hours
Mondays and Wednesdays from 1-2 pm, or by appointment. Feel free to email or stop by my office at any time; if I can’t talk right then we can arrange for another time.

Required Texts and Materials

National Council of Teachers of Mathematics [NCTM] (2000). Principles and standards for school mathematics (PSSM). Reston, VA: NCTM. Please sign up for a free 120-day trial access to PSSM; go to http://standardtrial.nctm.org/triallogin.asp. This will give you access sufficient for our class. However, if you join NCTM, you also gain access to an on-line teaching journal of your choice (see below). This can be helpful for your first written assignment. A student membership is $39. Go to www.nctm.org; click on membership and then on student e-membership.


Thumb drive. Please bring one of these regularly so that you can easily transfer files.

Supplemental Texts and Materials
We will also read some articles from Mathematics Teaching in the Middle School (MTMS) and the Mathematics Teacher (MT), two journals published by NCTM, as well as chapters from a few books. All such readings will be posted to Oncourse. Please print course readings and bring them to class.

Electronic Conference and Mail
I post assignments, documents shown in class, urls, some readings, questions about the readings, and other important information regularly to Oncourse. You are expected to check Oncourse and email regularly.

Important Dates (note that most due dates are tentative)

<table>
<thead>
<tr>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Classes begin</td>
<td>6 PN collection #1</td>
<td>6 PN collection #2</td>
<td>10 Topic for Final exam due</td>
</tr>
<tr>
<td>16 First HW due</td>
<td>11 GSP CD due</td>
<td>11, 13 Spring Break</td>
<td>17 PN collection #3</td>
</tr>
<tr>
<td>21 MLK Day — NO class</td>
<td>27 Midterm exam (Case Analysis) due</td>
<td></td>
<td>29 Final exam</td>
</tr>
<tr>
<td>30 MTMS or MT Crit. Refl. due</td>
<td></td>
<td>10 Topic for Final exam due</td>
<td>(Reconstruction Paper) due</td>
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Course Goals

This course focuses on mathematics teaching and learning in the middle school, while the second mathematics methods course in the fall focuses on mathematics teaching and learning in the high school.

This course has two major foci.

**The first focus is how to re-construct school mathematics in order to see it as problematic in nature.**

“School mathematics” means the mathematics that is typically taught and evaluated in schools, so it refers to mathematics curricula, but also includes mathematics instruction and assessment. Seeing school mathematics as problematic in nature means seeing it as open rather than closed, connected rather than fragmented and compartmentalized, rich and varied rather than uniform, and dynamic rather than static.

**The second focus is how to use this re-construction to envision creative possibilities for your students.**

To teach mathematics means to orchestrate mathematical thinking and learning for others. So in the course you are expected to use your re-construction of school mathematics to envision how you will communicate mathematically with your students and engage them in productive mathematical activity.

The main mathematical topics that we will examine are ratios and proportional reasoning, unknowns and variables, directed quantity and integers, rates and linear functions, and quadratic relationships and factoring. These are BIG ideas in middle school and early high school mathematics, and they are important for reasoning algebraically.

The main pedagogical topics that we will examine are problem-based instruction, discourse moves, differentiated instruction, assessment (formative and summative), and technology. These are all BIG ideas in teaching mathematics.

Specific goals of the course are:

1. **To experience mathematical reasoning in a way that will serve as a framework and guide as you attempt to bring forth such reasoning in your students.** This goal includes coming to understand aspects of your own mathematical thinking that you take for granted and developing a habit of searching for foundational ideas in your own mathematical activity. It also includes developing imagery for your own mathematical thinking and using it to think about how your students may develop their mathematical ideas.

2. **To analyze the mathematical foundations for school mathematics, including connections among topics.** This goal involves exploring questions like: What is involved in learning and using proportional reasoning? What are critical ways of thinking involved in learning integers? How do people come to understand rates and linear relationships?

3. **To use your analysis of the mathematical foundations for school mathematics as a basis to guide your (future) students in constructing critical mathematical concepts.** This goal includes designing mathematical tasks and activities for middle school students that will engage them in creative mathematical thinking, as well as developing an understanding of how students build mathematical concepts. Again, imagery is critical here!

4. **To develop images and ideas about teaching mathematics that are compatible with the notion that students construct their own mathematical knowledge based on mathematical actions and interactions.** This goal involves exploring questions like: What kinds of teacher moves, practices, and norms (e.g., revoicing, asking good questions, establishing a problem-solving environment) can support students’ construction of mathematical knowledge? How does one develop these moves, practices, and norms?

5. **To engage in discussions about a range of current issues about mathematics teaching and learning.** This goal includes co-creating an environment in which learners share and justify their thinking, ask questions, make conjectures, and take risks. This goal also involves thinking about ways to design your future classroom to facilitate mathematical learning for all students. Issues to consider include how to engage students in mathematical conversations, purposefully tailor instruction to diverse learners, assess the progress of students, and use technology creatively and critically.
***Some of the most important “methods” you have as a teacher of mathematics are (a) your own evolving, creative mathematical thinking; and (b) your evolving understanding of your students’ mathematical thinking and how it can change through engaging students in productive mathematical activity.***

Abridged Description of Course Assignments

I will try to make the purpose of each assignment clear. If you have questions about the purpose of the assignment or what is expected of you, please ask—I am always happy to discuss your concerns with you.

On all written work, I expect you to demonstrate correct use of the English language with regard to grammar, punctuation, spelling, and overall flow of writing. Please proofread and revise your work before submitting it. If you have weaknesses in writing, find someone who will help you revise your work for you before you turn it in (see also the “Guidelines and Evaluation Practices for Written Assignments” handout).

Each of the course assignments has been allotted a certain number of points out of 400 possible points that you can earn in the course. More information on how I will evaluate your assignments will follow, and I will hand out rubrics for each assignment.

All written assignments (#5-7 below) and some problems (#1) are to be submitted electronically using Oncourse. Detailed descriptions for all written assignments (#5-7), including evaluation rubrics, will be distributed at a later time and will also be available through Oncourse. Here are brief descriptions:

1. **Problem Notebook (PN):** One of your greatest assets in understanding students’ mathematical thinking is understanding and deepening your own mathematical thinking. Therefore, part of this course is about doing mathematics, generating mathematical conversations with each other, reflecting on your own mathematical knowledge, and designing problem sequences for students. We will work on many mathematical problems during the semester, and we will also design sequences of problems for students. **So, please acquire and keep a thin 3-ring folder of the problems that we do (in class and for homework).** You can expect problems to be assigned weekly, but I will collect your notebook THREE times during the term (approximate dates are given on the first page of this syllabus). When I collect your notebook I will:
   - evaluate your work for completeness (specified problems worked on thoroughly)
   - read and assess about 5 mathematics problems in detail
   - read and assess your work in designing a problem sequence with a specific mathematical focus and teaching goal

   Each PN collection will be worth 45 points out of the total 400 points for the course (see rubric on the next page). Problem notebooks should be turned in on the **due date, by 2:30 pm (start of class).** Late notebooks will earn penalties as noted below. **In some cases, you will submit problems via Oncourse because we will do a good deal of mathematical work with JavaBars and GSP.**

2. **First Homework:** To prepare for the first PN collection, I’ll ask you to turn in a short homework assignment worth 20 points (see rubric on next page). This will allow me to give feedback to you so that you understand the criteria I’m looking for when I evaluate your PNs.

3. **Readings:** For discussions in class, I will ask you to read articles, case studies (including chapters from Boaler and Humphreys’s book, CMI), and excerpts from books or on-line resources, including standards documents. Due to time constraints, we will not always discuss every portion of every reading in detail. That does not mean that the particular chapter or article is not worth reading.

4. **GSP Software Check and Potential Problem Checks.** Buying The Geometer’s Sketchpad (GSP) disk and submitting it to me by February 1 is worth 25 points. This check may decrease in value if I assess that we need to institute problem checks. In this course, problems are assigned for most class meetings, and most people start out very well doing problems. However, on-going problem completion often falls off later in the course. When/if it does, I will institute problem checks. Each
check is worth 2 points. You will earn 2 points if you have worked well on the assigned problems, 1 point for some work but not complete work, and 0 points for no work. This policy models the kind of homework checking that I used to do with my high school students (it is an important part of a homework system, although not the most important part). Together these two checks total 25 points, so when/if we have problem checks, the GSP software check will decrease in value.

5. **Critical Reflection on a Mathematics Teaching in the Middle School or Mathematics Teacher article:** Write a critical reflection on an article from either of these NCTM journals. The article should be recent (published within the last 7 years) and address the topic of algebra or algebraic reasoning. In your reflection, give a summary of the main point(s) of the article, describe the mathematical thinking involved in any activity presented, address the strengths and weaknesses of the article, and tell what you have learned from it. Your reflection should be 3-4 double-spaced pages and is worth 30 points.

6. **Case Study Analysis (the Midterm Exam):** Write a thorough analysis of a case study of middle school mathematics teaching (handed out in class). Your analysis will address issues that we discuss in class, including the mathematical reasoning involved in the case, the cognitive demand of the mathematical tasks in the lesson(s), evidence of student learning, identification and implications of specific teacher moves and practices, discussion of moves the teacher could use next, and other focal questions. We will read and analyze at least one case together prior to the midterm exam, so you will get a sense of what is involved in this assignment. Your case study analysis should be 6-9 pages double-spaced, with appropriate accompanying diagrams and/or problems. This assignment is worth 90 points.

7. **Reconstruction of a Mathematical Topic (the Final Exam):** With a partner, reconstruct a mathematical topic in school mathematics as problematic. Your reconstruction should be in response to these two questions: “How can we (as middle or high school teachers) approach (mathematical topic) conceptually, based on reasoning? What creative problem solving opportunities can we open up for our students, and how can we prepare to differentiate instruction for diverse learners?” The reconstruction of a mathematical topic is not a plan for a single lesson. Instead, it’s a big picture view of your goals, tasks, and activities for a diversity of students in a particular mathematical area, and it can be the foundation of many lesson plans. In your paper, explain how you as teachers re-conceive of this mathematical topic conceptually, discuss the mathematical thinking and problem solving activity you are aiming to help your students develop, and describe problems and activities that you will use with students, including plans for differentiation of instruction. Justify your choice of problems and activities based on your goals—the mathematical thinking you are aiming to help your students develop. Write up your reconstruction in an 8-10 double-spaced page paper, with appropriate accompanying electronic files. This assignment is worth 100 points.

**Grading Policies**

- **Grading Standards:** Grades are based on individual performance in all aspects of the course, with grading rubrics provided for all of the assignments. Every attempt will be made to give grades that are close to those suggested by the Teacher Education Undergraduate Grading Guidelines. As noted in the guidelines, (1) an A is representative of outstanding performance and (2) “it is virtually impossible to pre-specify all details necessary to achieve a given grade.” The guidelines also state “Students should recognize that effort alone does not necessarily guarantee above average grades.” The grade distribution for mathematics methods courses suggests that most students obtain grades ranging between B and B+. However, with grades based on individual performance rather than a comparison to others, the average grade for the course could end up higher or lower than that.

- **Grading of Problem Notebooks:** At every Problem Notebook (PN) collection, I will use the following rubric to evaluate your work:

<table>
<thead>
<tr>
<th>Mathematics Problem Notebook</th>
<th>Weak</th>
<th>Average</th>
<th>Good</th>
<th>Strong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoroughness (all problems completed thoroughly)</td>
<td>1-4</td>
<td>5-6</td>
<td>7-8</td>
<td>9-10</td>
</tr>
</tbody>
</table>
A note about Explanation and Analysis…
You should expect to do a lot of writing in your notebooks. In general, after you have written an explanation of your mathematical thinking, reread it as if it were someone else’s thinking. Is what you wrote just a sequence of “things to do”? If so, then you haven’t really explained; you’ve described, or reported, what you did. In writing explanations, the main idea is to push beyond an account or description by including reasons for what you did. Focus on the decisions you made in solving a problem and the motives or reasons for those decisions. For example, if you decide something has to be divided into 10 equal pieces, then explain your motives for that—why 10 parts and not 3, for example? You should also note the consequences of your decisions, such as “this amount, which I call 1 gallon, is now in pieces that are each 1/10 of one gallon.” Making consequences explicit gives you—and your reader—additional information about where you’ve been and where you might go next.

A note about Problem Sequence Design…
Prior to each problem notebook collection I will ask you to design a problem sequence for middle school/early high school students with a particular mathematical focus and a particular teaching goal. The mathematical foci will be related to the topics we work during the term (see p. 2) and tied to our problem sets. The teaching goals will include posing a sequence of problems (a) to introduce an idea or concept that students might learn, (b) to develop an idea or concept that students are in the process of learning, and (c) to assess student learning. Discussion of the problem sequence will involve giving a rationale for how the problems are sequenced and stating the kinds of thinking you are intending the problems to elicit. In some cases, you’ll also describe the questions that you, as a teacher, will ask to orchestrate mathematical conversation and communication about the sequence of problems.

- **Policy on Resubmitting Assignments:** If you earn less than 75% of the allocated points on an assignment (other than the Final Exam), you may, if you wish, resubmit the assignment within two weeks of the time the original is returned to you. Please notify me immediately that you plan to resubmit the assignment and include the original along with your revised version. When grading a resubmitted assignment, I look to see that you have revised the assignment based on the comments made on the original. The maximum grade on a resubmitted assignment is 75% of the allocated points. Fyi, I often do not get to grade and return revisions as quickly as I grade and return work on our “regular” schedule. I do not allow resubmitting of the Final Exam.

- **Policy on Late Assignments:** I expect that assignments will be turned in by the announced due dates and times. Assignments are to be submitted online using Oncourse, unless otherwise noted. I will accept assignments after the due date, but your grade will decrease by 10% of the allocated points for each day the assignment is late.
Policy on Computer Accidents: Please make sure you save your work frequently and keep backup copies of your files. Computer accidents, while very unfortunate, are not an acceptable excuse to avoid penalties for late work.

Policy on Lost Assignments: You should always keep a copy of every computer file or paper you turn in until your work is graded and you have received your course grade.

Attendance: Attendance is required for all class sessions. Attendance is important for the following reasons. First, as a future teacher it is important to develop the sense of responsibility needed to meet your class every day. Second, activities, ideas, and concepts we work on in class are useful to you as a beginning teacher, and they cannot easily be built up through readings or someone else’s notes. Third, class includes important whole-class and small-group discussions, as well as laboratory hands-on activities; many of these activities cannot easily be made up individually if you miss class.

Calculation of Final Grades: As noted above, the points for the course total to 400 points as follows:

| First Homework: 20 pts | MT/MTMS Review: 30 pts |
| PN Collections (three): 135 pts | Midterm Case Analysis: 90 pts |
| Problem Checks and GSP Check: 25 pts | Re-Construction Paper (Final): 100 pts |

The chart below shows the point totals required to achieve specific final course grades, based on a typical 90%-80%-70%-60% scale. Note that the cut-off for an A is 95%, not 93%.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
<th>Grade</th>
<th>Points</th>
<th>Grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (95% +)</td>
<td>380 points</td>
<td>B- (80%)</td>
<td>320 points</td>
<td>D+ (67%)</td>
<td>268 points</td>
</tr>
<tr>
<td>A- (90%)</td>
<td>360 points</td>
<td>C+ (77%)</td>
<td>308 points</td>
<td>D (63%)</td>
<td>252 points</td>
</tr>
<tr>
<td>B+ (87%)</td>
<td>348 points</td>
<td>C (73%)</td>
<td>292 points</td>
<td>D- (60%)</td>
<td>240 points</td>
</tr>
<tr>
<td>B (83%)</td>
<td>332 points</td>
<td>C- (70%)</td>
<td>280 points</td>
<td>F</td>
<td>&lt; 240 points</td>
</tr>
</tbody>
</table>

Attendance and Final Course Grades: Students who are continually participating and have good attendance will have their point totals “rounded up” at the end of the semester if their score is a borderline case. For example, if someone who has earned 346 points has missed class only once, and participated regularly and professionally, their score will be rounded up to a B+. Someone with more than two absences who has earned 346 points will not have their score rounded up to a B+ and will earn a B. I usually do not round up scores in the A-range. Students who accrue unexcused absences will be notified via email. An alert form for excessive number of absences will be filed for students who accumulate more than 4 unexcused absences. Students who accumulate 6 or more unexcused absences will receive an FN (failure for nonattendance) grade. A doctor’s note stating the student was too ill to attend class is usually needed for absences to be considered excused; there is a limit of 3 excused absences in the semester. After 3 excused absences, subsequent absences will be considered unexcused. Please inform me ahead of time if you have an unavoidable absence; please inform me via email if you are experiencing an unexpected event that will cause an absence.

If you do miss a class meeting: (1) Talk in detail with at least one classmate about what we did during class. Preferably talk with two classmates, so you get more than one perspective. (2) Check Oncourse for all new postings, emails, etc. You are responsible for any and all information that occurred during your absence.

Tardiness: For all the reasons given about attendance, please don’t be late to class. We have a short time together, and we will need to use all of it to accomplish the goals in the course. Tardiness not only is detrimental to the person who is late (who will miss important information and/or activities); it is disruptive to others. However, I know that occasionally life intervenes. Please inform me if you know you have an unavoidable conflict and will be late to class.

Religious Holidays: The policy at Indiana University is that instructors must reasonably accommodate students who want to observe their religious holidays at times when academic requirements conflict with
those observances. If a conflict with a religious observance exists, a student must make a request to the
instructor for a reasonable accommodation for that observance by the end of the second week of the
course. Any relevant change to the course calendar affords a new opportunity to make such a request in a
timely manner. The request is to be made in writing on a standardized form available at this website:
http://www.indiana.edu/~vpfaa/welcome/forms.shtml#Forms (scroll down).

- *Cell phones, newspapers, etc.: Please turn cell phones off during class. Please do not send
text messages during class. If I have to ask you twice not to text, you will accrue an absence.* If you
have an unusual circumstance, please inform me. Also, please do not bring newspapers or other outside
reading materials to class—we have plenty to do together to keep us busy!

- *Checking email:* When we work on computers in the course, please refrain from surfing the web,
checking email, sending instant messages, etc. I know it’s very tempting to engage in these activities,
especially if you finish a problem or discussion early. However, we have a short time together, and we
need all of it for working on the problems and at hand and the issues that we are discussing.

- *Academic Misconduct:* I hope there will be no need to worry about academic misconduct (cheating,
plagiarism, etc.). All university policies concerning academic misconduct will be strictly followed and
can be found at http://studentaffairs.iub.edu/ethics/. In particular, it is my obligation to report any
academic misconduct at the university level. Good information about plagiarism can be found at
http://education.indiana.edu/~frick/plagiarism/. **It is your responsibility to be familiar with these
policies.** Be forewarned that submitting other people’s electronic sketches as your own work is a breach
of academic misconduct, unless the assignment allows collaborative work.

**Final Note**

I want to help you to become an excellent middle school or high school mathematics teacher. Please feel free
to contact me (email is best, or stop by my office, 3060) should you wish to discuss matters related to the
course or to teaching in general. I am happy to discuss concepts and ideas, course assignments, as well as
your grades on assignments. I look forward to working with you this semester!

**A Few On-Line Resources**

- National Council of Teachers of Mathematics (NCTM): http://www.nctm.org
- Common Core State Standards (CCSS): http://www.corestandards.org/
- Math is More (a website about mathematics education): http://www.mathismore.net/
- Math Forum (a website that includes Ask Dr. Math): http://www.mathforum.org/
- Website of women in mathematics: http://www.agnesscott.edu/Lriddle/women/women.htm
- Mathematicians of the African Diaspora: http://www.math.buffalo.edu/mad/00.INDEXmad.html
- Illuminations at NCTM (a website of activities for K-12 math ed): http://illuminations.nctm.org
- Middle School Mathematics curricula developed to align with NCTM’s principles and standards (PSSM):
  - Connected Mathematics Project: http://connectedmath.msu.edu/
  - Mathematics in Context: http://www.showmecenter.missouri.edu/showme/mic.shtml
- Modeling Middle School Mathematics Project (a website that shows teachers implementing curricula listed
  above, as well as some other curricula): http://www.mmmproject.org/video_matrixS.htm
- Teacher Professional Development by Annenberg (mathematics series):