Math 353: Methods and Materials in the Teaching of Elementary School Mathematics
Winter Semester, 2008
TENTATIVE

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This class meets from 10-10:50 on Mondays & 9-10:50 on Tuesdays.

We will meet during our scheduled final exam time: Thursday, April. 30 from 10-11:50.

NOTE: Since this course is on WebCT assignments not outlined in this syllabus, along with clarifications or elaborations of the assignments listed herein, will usually be posted there. Also, check your **nmu.edu** *email account* ***regularly*** *for emails about the course.*

Brief Description of the Course:

This course is designed to acquaint prospective elementary teachers with contemporary methods and materials employed in the teaching of mathematics in the elementary school. We do this by exploring how children learn mathematics and how teachers design activities that help students achieve mathematical goals. My approach to teaching and learning mathematics is consistent with the *Michigan Curriculum Frameworks* and the National Council of Teachers of Mathematics' *Principles and Standards for Teaching Mathematics*.

A few seconds reflection will make it obvious that this course cannot teach you how to teach each and every topic in the K-8 math curriculum. ***My goal is to help you develop the ability to use various curricular materials to plan lessons that you will teach using appropriate methods.*** Naturally, I have views on appropriate teaching methods. These views are based on my experiences as an elementary and university teacher and as a researcher of teaching and learning. My beliefs about mathematics teaching align with those contained in the documents listed above and those of our text. ***While you may disagree (and express that disagreement) with the methods advocated by the authors of these documents (and by me), to pass this course you must demonstrate that you understand the methods advocated.*** (You cannot justify disagreeing with concepts if you don't first understand the concepts.)

As this is a mathematics methods course, we will focus on **using mathematics in teaching**. There are two aspects involved in using mathematics in teaching and we will work on both: (a) having a robust sense of what it means to be proficient in mathematics, and (b) understanding and being able to use mathematics in ways needed for the work of teaching.

First, teachers need to appreciate what kinds of understanding and skill they would like their students to develop. So we ask: *What is involved in knowing and doing mathematics proficiently?* In reading and language arts, most teachers have a highly developed sense of what it means to be literate. Understanding what the analogue is in mathematics is more elusive.

This course is designed to help you consider what it means to be mathematically capable. Here is a provisional definition: mathematical proficiency involves conceptual understanding, procedural fluency and skill, and the use of a variety of *mathematical practices*—skills, tools, and habits of mind and action—important to learning, doing, and using mathematics. Examples include using mathematical language, justifying claims and solutions, and developing and comparing representations. Being mathematically proficient also includes confidence in one's own capacity and a sense of how to work productively.

Second, *teaching mathematics requires a great deal of specialized mathematical knowledge and reasoning*. Your own understanding, fluency, and comfort with mathematics will be important to your effectiveness as a teacher. Teaching depends on mathematical understanding and skill that different from the kind it takes to do well as a math student or to be good at other jobs that require mathematics. In planning lessons, teachers need to determine the mathematical goals of activities, anticipate the varied ways students might respond, and prepare mathematically for what might happen as the lesson unfolds. Teachers must prepare good questions to ask and generate easier as well as harder versions of the problem, either as a back-up plan or as a way to focus or extend students' work. In order to hold high expectations of students, teachers need a keen sense of the complexity of particular mathematical ideas, and ways they can be scaffolded for students' learning.

We will work this semester on developing mathematical knowledge that is useful for teaching, and on learning to use mathematics as teachers. Our focus is the *mathematical content* of, for example, place value with whole numbers and decimals; the meanings of the operations of addition, subtraction, multiplication, and division; and procedures, place value meanings, and representations for whole and decimal number computation. Within topics, we will also work on *mathematical practices*, focusing particularly on the use of mathematical language, representations, and mathematical reasoning.

One semester is a short time to achieve the goals sketched above. If you work hard and attentively, you will learn to *do* mathematics teaching, as well as *analyze* it. You will develop skills of watching and listening that enable you to make sense of how others think mathematically and express themselves in multiple ways. You will develop practices that enable you to attend and respond to students' mathematical ideas and ways of thinking, and to plan, teach, and analyze mathematics lessons. You will elaborate your knowledge of some areas of mathematics in ways that ready that knowledge for the specific work of teaching it.

Working on these elements of mathematics teaching will enable you not only to get started, but also to go on learning from practice. One of my goals is for you to learn *how to learn teaching*. This involves learning how to study and examine practice, and to develop criteria for judging alternative instructional decisions and moves. In short, it means asking, exploring, and experimenting with the teaching of mathematics in school, *in ways that make children's ideas central to the work, and that preserve the mathematics with intellectual rigor and integrity*.

Prerequisite: **Admission to the methods phase of teacher education; at least a C in MA 150 and MA 151.**

Text: Van de Walle (2007). *Elementary and Middle School Mathematics*, 6th Edition. Longman

General Requirements:

- Professional behavior and attitude at all times:
- A genuine interest in learning the subject matter
- A sincere interest in the needs of elementary students
- Being a valuable and contributing member of our class
- Question rather than pass judgment
- Reflect excitement about teaching and learning
- A spirit of cooperation with and support for your peers
- Clear, grammatically and mathematically correct language both in discussions and in assignments
- *Involvement* in *our* class—not writing papers or studying for another class, not checking your calendar, etc. Students engaged in such activities will lose participation points.
- Appropriate Classroom Laptop Use: Although laptops in class open up new learning possibilities for students, sometimes students utilize them in ways that are inappropriate. No instant messaging, e-mailing, surfing the Internet, playing games, writing papers, doing homework, etc. during class time. Acceptable uses include taking notes and working on assigned in-class activities, projects, and discussions that may be enhanced by laptop use. It is easy for your laptop to become a distraction to you and to those around you. Inappropriate uses will be noted (silently) and will result in loss of a grade in participation points. If you use your laptop during class, at the end of the class period you will be expected to email me the notes you typed in class (I will not ask for them but will keep records of those who do/do not.).
- Professional attire in Bothwell Middle school. At minimum, this means no shorts or blue jeans. Also, you will wear a name badge identifying you & your affiliation at all times in the schools (if not, you will lose participation points).
- Attendance at all class sessions. If you must miss a class for medical reasons, you are expected to provide an excuse from your medical provider.
- Participation is an important part of the class—and hence, your grade. This means that you must be on time and prepared (read assignments, prepared materials, completed homework, etc.) for all class sessions. There will be times when we work individually, in small groups, or as a whole class. You will be expected to participate in all types of work/discussion to help develop understanding of teaching mathematics in the elementary school. Participating means volunteering to answer questions and asking questions in the whole class discussions, not just in small groups. Not participating because you are “shy”, feel “intimidated by mathematics,” or fear “looking stupid” is a hindrance to learning and will lessen your growth as a teacher.

Assessment (further details will be provided in class, via email, or on WebCT as necessary, feel free to ask questions about any assignments—the earlier, the better)**.**

When completing assignments please remember that I am not a mind reader. One of the roles of a teacher (me, in this case) is assessment. *To assess your learning, I must be able to understand what you are thinking*—your goal is to communicate to me what you are learning. This requires clarity and precision on your part.

- Attendance and participation. (75 pts)
- A number of lesson plans and/or sequences of lesson plans. (point values will increase across the semester as your learning, experience, and ability increase; see attached "Lesson Plan Requirements" for lesson plan expectations) **ALL** lesson plan assignments are to meet **ALL** the requirements listed.
- As part of your Bothwell experience, you will create a sequence of four mathematics lesson plans. The lessons are to build upon each other (i.e., a mini-unit). In general, they will not be review or practice. The major goal is for you to demonstrate your understanding of the NCTM *Standards* and how the *Standards* might look in practice. During the semester, I will meet with each Bothwell group (these groups are organized by Block 2 Education faculty). We will discuss your ideas for mathematics content and I will help you think about appropriate pedagogy. (120 pts; see attached "Lesson Plan Requirements" for lesson plan expectations)
- Reflections on your Bothwell teaching experience. (75 points; see attached "BMS Reflection Assignment")
- You will be assigned readings from the text, preparation of materials, and various other out-of-class work. Questions may also arise from in-class activities and discussions. For some of these, you will write responses for homework. (5 to 15 pts ea—about 50-75 pts total)
- Three or four quizzes which will be given during the last portion of some class periods (students may leave as they finish). Questions will generally come from the assigned "Writing to Learn" or "For Discussion and Exploration" sections at the end of chapters in the text. (10 pts ea—30-40 pts total)

All written assignments are to be typed and submitted in hard copy form (not e-mailed). When you refer to a book, article, or other source, you <u>must</u> provide a <u>full</u> citation. When you use resources to generate ideas for lesson plans, etc., you must provide a citation. (If you are unsure how to cite, look at the citations in our text. Web citations must be complete enough for me to easily access the same webpage.)
The Bothwell "mini-unit" is to be submitted by the group as a whole with CLEARLY stated indication of who is teaching which lesson, the order of the lessons, and any non-math lesson plans I might need to understand the math lesson plans (eg, if data from an experiment in science is to be used in the math lesson, include the science lesson so I may be able to assess whether the data is appropriate, will support the math, etc.)

[Note: You may design any assignment to double-count with another course in the block—but it is *your* responsibility to make sure it meets the criteria of the instructors of both courses.]

All work completed for this class must be original. I expect each individual to think, write, reflect, question, and even sometimes struggle through the concepts presented in class, the text,

and other readings. This is the only way you will learn and grow as a teacher. Students who commit academic misconduct, including plagiarizing work (copying or borrowing heavily from published materials), or copying or borrowing heavily from another student's work will fail this class. The university holds Academic Misconduct as a serious and punishable infraction.

Feel free to contact me (in my office, via e-mail, before/after class, etc.) when you feel you need help. I am happy to discuss assignments before they are due and have resources that I am willing to share (these may be especially helpful for the lessons you teach). Do **NOT** wait till the last minute (e.g., the day before you will teach or a major assignment is due) to seek help! Contact me if you do not understand the way I am grading assignments or if you are concerned about the grades you are receiving. If something becomes an issue, contact me immediately—do not wait till the last week of the semester.

Grades will be on the following scale:

A	93-100 percent	A-	90-92 percent		
B+	88-89 percent	B	83-87 percent	B-	80-82 percent
C+	77-79 percent	C	70-76 percent	C-	67-69 percent
D	60-66 percent	E	below 60 percent		

Note: If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office by: coming into the office at 2001 C. B. Hedgcock; calling 227-1700; or e-mailing disserv@nmu.edu. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

Lesson Plan Requirements

You are not expected to re-invent the wheel. Feel free to make use of resources for planning lessons. Provide references for resources you have used. Do **not** assume that, because a lesson plan is on the web (or anywhere else), it is necessarily a lesson plan that reflects the NCTM *Standards*—even if it claims to. Your goal is to *design* lessons that conform to the NCTM *Standards*. That is on what you will be graded. (Using references does NOT mean copying others' lesson plans. You may get *ideas* for lessons but the plan is to be designed by *you.)*

You may use any lesson plan format but it must include (& I must be able to identify) the following (order is flexible):

- What are your mathematical goals?
  These should be **learning** goals—indicate what the students will (hopefully) **understand** after the lesson that they did not before. Learning goals refer to mathematical *concepts*; they are not what the students will *do*. Goals are not "able to do." I.e., **not** "They will solve problems." **not** "They will measure shapes." **not** "They will be able to add two digit numbers." etc. "Students will be able to" goals may be included (in fact, are highly appropriate) but must not be the only type of goal you list. The "able to do" goals should help students meet the "understanding" goals. It would not hurt to look at the lesson plans in our text and the early parts of the chapter in our text that relates to the content of your lessons. Also, students often write goals such as "students will understand how to …" This is really a procedural goal (how to do something is following a procedure) with the word "understand" thrown in. It is not what I'm looking for.
- What will the teacher do? What will the teacher say? What will the teacher ask? Planning means that you have thought through what you might say, how you might ask questions that promote students' mathematical reasoning and problem solving.
  - Don't say things like, "The teacher will explain the concept." This is completely generic & does not tell me what you are thinking—or suggests you have not spent the time to think through what you intend to say. What will s/he say to explain the ideas to the students? But, also consider whether the teacher needs to explain at all (recall what our text says about teacher explanations).
  - Don't say, "We will discuss …" This too is generic & does not tell me what you are thinking. If you will have a discussion, give examples of what you would say/ask & what you would expect of students in response. Why are you discussing? What ideas do you intend the discussion to elicit?
  - Don't say, "I will ask the students if they understand." Think about yourself as a student when teachers ask this question; few students willingly admit they do not understand—esp. when the rest of the class indicates they do. However, it **is** important to be able to discern if the students *do* understand. How you do so should appear in the assessment section of the plan.
  - If, say, your lesson is about geometry, don't say, "I will present shapes." Be explicit about what shapes you will present, in what order, and why these shapes & that order. Provide copies/diagrams of each of the shapes **exactly** as you will provide them. This is part of planning.
- What will the students do? (If the lesson has multiple parts, you should provide this information for each part.)
  - Will they be in their desks, at the board, writing, drawing, etc?

    - Will they be using manipulatives? How will they obtain them? How will they be introduced to them (if this is a first experience with them)?
    - Will they work individually? Pairs? Groups? Whole class?
- How will you "wrap up" the lesson? This should be more than just thanks, good job. It should be more than just, "What did you learn?" Closure should help students put together ideas brought out in the lesson, it should help students reach your goals. Note: the teacher should not be the one putting the ideas together. The goal would be to have questions that help students put the mathematical ideas together. E.g., "When we made all the rectangles with 24 square tiles, what did you notice about the relationship between the shape of the rectangle and the perimeter?"
- What is the mathematics available from the activity?
  What areas of math does the lesson address? Recall our conversations about math in (a) our in-class activities, (b) various lessons we have observed, & (c) the NCTM *Standards* & MI *Frameworks*. This is to be much more specific than, say, "Geometry." or "Measurement." or "Area & perimeter."
- How will you assess your students?
  Make sure you include information on how you will assess students. This does NOT need to be a worksheet (but it may). You must be clear about how you will tell if students are meeting your learning goals (i.e., the assessment and goals should be related). [Completing a worksheet in & of itself is not such an indicator. I am sure many of you have done worksheets without having understood the concepts—I know I have.]
- If you will use any worksheets, <u>include them with the LP(s) you turn in</u>.
- Approximate time for <u>each part</u> of the lesson. How long will the intro take? Explaining the activity or problem? How long will you give students to work? Passing out materials? Etc.
- What materials do you need to have or prepare before the lesson?
- Any other info you deem important & necessary.

Feel free to utilize the Selection & Evaluation Criteria & the Problem Solving Goals in our text to help you plan.

BMS Reflection Assignment
Due: Tuesday, April 22, 2008

This reflection is geared toward the mathematics lesson you taught. However, it would certainly be appropriate to draw upon the other mathematics lessons you observed and/or the non-mathematics lessons you taught and observed. To offer a clear picture it may also be important to provide information about prior &/or subsequent lessons in the mini-unit.

First, describe the lesson you taught. This should be a thorough description of the lesson. You should describe what took place from the beginning of the lesson to the end. The description should include what the teacher said and did, what the students said and did, how the students were grouped, and so forth. The description should make clear what the mathematics was that the students were engaged in.

Second, compare what actually took place (what you just described above) with your lesson plan. That is, describe in what ways the lesson followed the lesson plan &/or diverged from the lesson plan. Explain why the lesson diverged from the lesson plan if it did.

(The first two parts (above) are descriptive; they are not meant to be self-evaluative. The analytical part of the assignment follows.)

Third, critique the lesson. Critiquing does not necessarily mean criticizing. Often movie reviews, which are critiques of movies, describe them in favorable terms -- or a mix of favorable and unfavorable terms. The idea here is to step back and decide what went well with the lesson and *why* it was successful; what might have gone better and *why* it was less successful. For example, you might decide that the students were not engaged to the extent you desired. You might decide that this was because of the activity that you assigned (it was too hard, too easy, uninteresting, unrelated to their lives, etc.), the way it was presented (you weren't clear in expectations, you gave them too much freedom, etc.), the grouping of students (too many per group, the wrong mix in some groups, etc.), or for one or more other reasons that you specify. Explain your reasoning (give support).

Fourth, look at the goals and assessments for your lesson plan. Describe the extent to which your students met the goals. Use the data that you collected from student assessments (worksheets, ongoing assessments, projects, etc.), as evidence to support your claims. <u>Attach the evidence</u> from students' written assignments to your response.

Fifth, describe what you would do differently if you taught the same lesson to a similar group of students. Explain how the changes you propose would improve the lesson. How would the changes you propose help the students better achieve the goals of your lesson plan?