Syllabus

Fall, 2010

Course: Math 355, *Content and Methods in Mathematics II*, 3 credits
Class Times MWF 1:10pm -2:00 pm
Class Room MC 418

Instructor: Dr. Michael Wodzak
RC 219
e-mail: mawodzak@viterbo.edu
Phone: 796-3659 [office]

Hours: Daily 9am – 10am

Final Exam: Friday 17th December 7:40am – 9:40pm

Prerequisites: Grade of C or better in Math 255 or permission of instructor

Text: *Mathematics for Elementary Teachers*, 4th ed., by Tom Bassarear, Houghton Mifflin, 2007.
(This text was used in Math 255 also)
Activity Packet (Also used in 255)

Please note: I realise that you may not be free at 9 am on any morning. However, I am in my office from around 8 until noon (11 on Fridays) and all through the day on Tuesdays, so there is lots of time for you to make an appointment as needed.

Description

This course is designed to introduce the preservice K-9 teacher with ideas, techniques and approaches to teaching mathematics. Emphasis is on problem solving and problem posing, use of manipulatives and children's literature, and understanding children's thinking. The math content areas are geometry and rational numbers.
The Viterbo University Teacher Education Program has adopted a Teacher As Reflective Decision Maker Model and the Wisconsin Standards For Teacher Development and Licensure, also known as INTASC (Interstate New Teacher Assessment and Support Consortium) Standards. Each course is designed to contribute to the development of one or more of the INTASC Standards. (These standards can be found at http://www.dpi.state.wi.us/dpi/standards/index.html)
Franciscan values, Viterbo core abilities and the liberal studies are the basis of the Viterbo education experience. Focus of every professional education course is on the learning of the PK-12 pupil. Viterbo education courses infuse constructivist practices, use of technology, PK-12 collaboration, awareness of diversity, traditional and authentic assessment, teacher work sample components, and real-world experiences into the preparation of the preservice teacher.

Wisconsin Standards for Teacher Development and Licensure (INTASC) Standards 1,2,3,4,6,8,9
Wisconsin Model Academic Standards A, B, F
Wisconsin Content Guidelines 1,2,3,4,5,6,7,8,9,10
Viterbo Core Abilities
Thinking, Communication, Cultural Sensitivity

Resources: You may qualify for free tutoring in the Learning Center.
The following materials are on reserve in the Todd Wehr Library:
Sample solutions to investigations

Various books on problem solving

Methodology: Lecture, class discussion, small group work, student presentations.

Goals (INTASC 1)

To help students:

1. learn to value mathematics;
2. learn to reason mathematically;
3. learn to communicate mathematically;
4. become confident in their mathematical ability; and
5. become problem solvers and posers.

Objectives

Problem Solving (INTASC 1,2,3)

Upon successful completion of this course, the student will be able to:

build new mathematical knowledge through problem solving
solve problems that arise in mathematics
apply and adapt a variety of appropriate strategies to solve problems
monitor and reflect on the process of mathematical problem solving

Reasoning and Proof (INTASC 1,4)

Upon successful completion of this course, the student will be able to:

recognize reasoning and proof as fundamental aspects of mathematics
make and investigate mathematical conjecture
develop and evaluate mathematical arguments and proofs
select and use various types of reasoning and methods of proof

Communication (INTASC 6)

Upon successful completion of this course, the student will be able to:

organize and consolidate his or her mathematical thinking through communication
communicate his or her mathematical thinking coherently and clearly to peers, teachers, and others
analyze and evaluate the mathematical thinking and strategies of others
use the language of mathematics to express mathematical ideas precisely
create and use representations to organize, record, and communicate mathematical ideas

Connections (INTASC 1,4)

Upon successful completion of this course, the student will be able to:

recognize and use connections among mathematical ideas
understand how mathematical ideas interconnect and build on one another to produce a coherent whole
recognize and apply mathematics in contexts outside of mathematics

Student Responsibilities

One cannot benefit from or contribute to a class discussion or activity unless one is physically present (this a necessary condition, not a sufficient one). **Attendance is required**. Call me (796-3658) if you will not be in class. A valid excuse is necessary to miss class. *Unexcused absences may lower your grade for the course.*

Assigned readings of the texts and handouts need to be done if meaningful discussion can occur.

As teachers you should appreciate the importance of class participation. Your active participation makes the course go. *Math is not a spectator sport*. Assigned problems and textbook exercises are ways for you to develop problem solving skills and reflect on your learning. Do the problems when they are assigned.

Content

I. Geometry

A. Spatial Reasoning

B. Van Hiele levels

C. Two-dimensional geometry

D. Three-dimensional geometry

E. Translations, reflections and rotations

F. Symmetry

II. Measurement
A. Length
B. Area
C. Volume
III. Rational Numbers
A. Models
B. Ordering
C. Renaming
D. Addition and subtraction
E. Multiplication and division
F. Decimals

Requirements

Two math activities, one on geometry and one on fractions (see handout)
Three investigations
Learning journal from class
Three exams
Four summaries of articles in **professional journals** on the following topics:

Geometry , Assessment, Fractions, and Equity
[Some good sources are *Arithmetic Teacher*, *Teaching Children Mathematics*, *Mathematics Teaching in the Middle School*, *AIMS*, and *School Science and Mathematics*.] (see handout)

Completion of a minimum of 10 hours of field experience working with an elementary student on mathematics (see handout)

A clinical journal of your sessions with your elementary student [**NOTE: YOU MUST MEET WITH YOUR STUDENT AND FULFILL THIS REQUIREMENT IN ORDER TO PASS THIS COURSE**.]

Evaluation
Points
Tests (200 points each) 600
Investigations 200
Clinical journal 80
Learning journal 60
Readings 40
Math Activities 20
total 1000

A Note to You

This is a course for prospective elementary and middle school teachers about how children learn mathematics and how to create positive, developmentally- appropriate mathematics instruction. Since we have all gone to elementary school, we have learned and "know" the mathematics which will be addressed in this course; in fact, we may know it so well that we have forgotten what it was like to ever not know it. Or, because of inadequate past instruction, we may feel we "know" certain mathematical topics but have never really understood them, or we may even dislike the subject. If this is the case, consider this course an opportunity to break the cycle of negative, disempowering mathematics teaching. Mathematics is an intellectual adventure, a powerful tool, and a creative experience for children. As a teacher, you can make it so.

Some of you may have had mathematics courses that were based on the transmission, or absorption, view of teaching and learning. In this view, students passively "absorb" mathematical structures invented by others and recorded in texts or known by authoritative adults. Teaching consists of transmitting sets of established facts, skills, and concepts to students. I do not accept this view. Quite simply, this is not what mathematics is. Mathematics is about discovery and understanding. You have probably come to the conclusion that math is about memorizing and applying formulae. This is unfortunate, and has happened because most teachers have a very natural concern that their students succeed on standardized tests. They are more concerned that their students pass the exam than that they do Mathematics. Test success is, after all, one way in which the teacher's own success is measured. However, such formulae are really only an end product of Mathematics, not the subject itself. Imagine a music class in which the students just put CDs into a player or an art class in which the students just cut pictures out of books and magazines and stuck them to the wall. This is precisely what happens in all too many Mathematics classes.

This does not mean that the math class has no place for formulae, only that these formulae should be mnemonics to help the students remember what they have already discovered and build on earlier understanding and discovery to progress further.

I have three goals when I teach. The *first* is to help you develop mathematical structures that are more complex, abstract, and powerful than the ones you currently possess so that you will be capable of solving a wide variety of meaningful problems. The *second* is to help you become autonomous and self- motivated in your mathematical activities. You will "get" mathematics not only from me but alsofrom your own explorations, thinking, reflecting, and participation in discussions. As independent students you will see your responsibility is to make sense of, and communicate about, mathematics. Charles Schultz, creator of "Peanuts", compared people to multispeed bikes and noted that "most of us have gears we do not use." Hopefully you will see mathematics as an open-ended, creative activity and not a rigid collection of recipes. And the *last* is to help you become a skeptical student who looks for evidence, example, counterexample and proof, not simply because school exercises demand it, but because of an internalized compulsion to know and to understand.
I want to help you learn to do something different from and better than what you have experienced as pupils in previous mathematics classes A mathematics methods class is about mathematics, about children as learners of mathematics, about how mathematics can be learned and taught, and about how classrooms can be environments for learning mathematics. It's a class where the students learn about learning mathematics while they themselves are learning mathematics.
As a teacher I have come to realize that when I teach mathematics I teach not only the underlying mathematical structures but I am also teaching my students how to develop their cognition, how to see the world through a set of quantitative lenses which I believe provide a powerful way of making sense of the world, how to reflect on those lenses to create more and more powerful lenses and how to appreciate the role these lenses play in the development of their understanding.
So I ask your help in establishing a mathematical community where one uses logic and mathematical evidence as verification rather than the teacher, where mathematical reasoning replaces the memorization of procedures, and where conjecturing, inventing, and problem solving are encouraged and supported.

You may find this experience frustrating at times. **Persevere**! Eventually I hope you will own personally the mathematical ideas you once knew unthinkingly or only peripherally (and sometimes anxiously). I want you to become competent and confident using mathematical ideas and techniques. I want you to be ready to learn how to get other persons actively involved in problem solving. To nurture a mathematical idea in the mind of a child might be easier if it first thrived in the mind of the child's teacher.

> In training a child to activity of thought, above all things we must beware of what I will call "inert ideas" - that is to say, ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh combinations . . . Education with inert ideas is not only useless: it is, above all things, harmful. Except at rare intervals of intellectual ferment, education in the past has been radically infected with inert ideas . . . Let us now ask how in our system of education we are to guard against this mental dryrot. We enunciate two educational commandments, "Do not teach too many subjects," and again, "What you teach, teach thoroughly." . . . Let the main ideas which are introduced into a child's education be few and important, and let them be thrown into every combination possible. The child should make them his own, and should understand their application here and now in the circumstances of his actual life. From the very beginning of his education, the child should experience the joy of discovery.
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> (Alfred North Whitehead, *The Aims of Education)*

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Americans with Disabilities Act

If you are a person with a disability and require any auxiliary or other accommodations for this class, please see me and Wayne Wojciechowski, the Americans With Disabilities Act Coordinator (MC 335 <796- 3085>) within ten days to discuss your accommodation needs.

It is somewhat surprising and discouraging how little attention has been paid to the intimate nature of teaching and school learning in the debates on education that have raged over the past decade. These debates have been so focused on performance and standards that they have mostly overlooked the means by which teachers and pupils alike go about their business in real-life classrooms - how teachers teach and how pupils learn.

Jerome Bruner

THIS SPACE FOR RENT