

C&I 432:
An Investigative Approach to Elementary Mathematics Instruction
Fall Semester, 2005

(for sections C1, C2, C4 and C5)

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Meeting time	Fridays, 1:00 – 2:50 PM	Mondays, 10:00 – 11:50 AM	Wednesdays, 7:00 – 8:50 PM	Fridays, 8:00 – 9:50 AM
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All sections meet in 4G Education Building

Course Overview:

This course examines an investigative approach to teaching elementary mathematics. Stated another way, what does it mean to teach mathematics in an investigative or inquiry-based manner? This course attempts to answer this question by engaging in a variety of tasks including the analysis of standards documents, mathematics lessons (video vignettes and classroom observations), student work (or student thinking), curricula materials, and planning and teaching lessons. As well, the course will consider the rationale for such an approach and it will call upon your knowledge of how children learn mathematics and the mathematics required (C&I 331 or 431) to be an effective teacher of elementary mathematics.

Course Goals:

1. To examine, illustrate, and model various approaches to teaching elementary mathematics
2. To participate in cooperative learning and collaborative lesson planning experiences
3. To explore how assessment is an integral part of instruction
4. To deepen understanding of mathematics and children's mathematical learning
5. To consider how mathematics instruction can meet the needs of diverse learners in a democratic society
6. To empower and foster confidence in teaching inquiry-based mathematics
7. To investigate instructional technologies appropriate for teaching and learning mathematics

Required Texts: (Available at the bookstore.)

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

Course Packet.

Course Tools:

Please bring to class a calculator, scissors, tape, ruler, and crayons or colored pencils.

Tentative Course Schedule

Session # OR Week Beginning	Topic	Readings, Class Activities, & Assignments
#1, For <i>Monday</i> classes this is August 24; <i>Wednesday</i> class this is August 31; <i>Friday</i> classes this is August 26	<ul style="list-style-type: none"> • Introductions • Syllabus & Course Overview • <i>Principles and Standards for School Mathematics—Vision and Rationale</i> 	<p>Read:</p> <ul style="list-style-type: none"> • Chapters 1 & 2 in <i>Principles and Standards for School Mathematics (PSSM)</i> <p>Activity:</p> <ul style="list-style-type: none"> • Introduction, Course Overview • View <i>Principles and Standards for School Mathematics—Vision and Rationale</i> <p>Assignment:</p> <ul style="list-style-type: none"> • Read carefully the course syllabus. Come to next class with questions, concerns, and typos!
#2, For <i>Monday</i> classes this is August 29; <i>Wednesday</i> class this is September 7; <i>Friday</i> classes this is September 2	<ul style="list-style-type: none"> • What do the <i>PSSM</i> mean? • Introduction to <i>Standards Project</i> 	<p>Read:</p> <ul style="list-style-type: none"> • Chapters 3-6 in <i>PSSM</i> • <i>ISBE Goals 6 – 10</i>, http://isbe.net/ils/math/standards.htm <p>Activity:</p> <ul style="list-style-type: none"> • Begin work on <i>Standards Project</i>
#3, For <i>Monday</i> classes this is September 12; <i>Wednesday</i> class this is Sept. 14; <i>Friday class</i>	<ul style="list-style-type: none"> • Introduction to Lesson and Unit Planning • Problem Solving 	<p>Read:</p> <ul style="list-style-type: none"> • Van de Walle, Chapter 22: Planning for Effective Instruction • Cai, J. (2000). <i>Fostering Mathematical Thinking through Multiple Solutions</i> <p>Activity:</p> <ul style="list-style-type: none"> • Problem Solving Workshop • Work on <i>Standards Project</i> <p>Assignments:</p>

<p>this is Sept. 9</p>		<ul style="list-style-type: none"> • Field Experience #1: First Impressions of a Classroom • Article Review
<p>#4, For Monday classes this is Sept. 19; Wed. class this is Sept. 21; Friday class this is Sept. 16</p>	<ul style="list-style-type: none"> • Teaching for Diverse Populations 	<p>Read:</p> <ul style="list-style-type: none"> • Bray, W. (2005). Supporting Diverse Learners: Teacher Collaboration in an Inclusive Classroom • Zaslavsky, C. (2002). Exploring World Cultures in Math Class <p>Activity:</p> <ul style="list-style-type: none"> • Teaching Lab – Mini-lessons focusing on diverse learners • Work on <i>Standards</i> Project <p>Assignment:</p> <ul style="list-style-type: none"> • Article Review
<p>#5, Week of Sept. 26</p>	<ul style="list-style-type: none"> • <i>Standards</i> Project Presentations • Culturally Relevant Pedagogy, Multiculturalism and Mathematics 	<p>Read:</p> <ul style="list-style-type: none"> • Tate, W. (1994). Race, Retrenchment, and the Reform of School Mathematics • D’Ambrosio, U. (2001). What is Ethnomathematics and How Can it Help Children in Schools? • Ensign, J. Including Culturally Relevant Math in an Urban School <p>Activity:</p> <ul style="list-style-type: none"> • <i>Standards</i> Project Presentations • Maya Math (Time permitting) <p>Assignment:</p> <ul style="list-style-type: none"> • Article Review
<p>#6, Week of Oct. 3</p>	<ul style="list-style-type: none"> • Algebraic Thinking (Patterns and Functions) 	<p>Read:</p> <ul style="list-style-type: none"> • Spear, et al (1997). Becoming Very-Able with Variables • Cai, J. (1998). Developing Algebraic Reasoning in the Elementary Grades • Usiskin, Z. (1999). Doing Algebra in Grades K-4 <p>Activity:</p> <ul style="list-style-type: none"> • The Variable Machine • Building with Toothpicks • Work on Unit Plan Project <p>Assignment:</p> <ul style="list-style-type: none"> • Article Review
<p>#7, Oct. 10</p>	<ul style="list-style-type: none"> • Algebraic Thinking 	<p>Read:</p> <ul style="list-style-type: none"> • Smith, J. (2000). Listening to Middle School Students’ Algebraic Thinking • Beckman, et al. (1999). Graphs in Real Time <p>Activity:</p> <ul style="list-style-type: none"> • What’s the Best Deal? • From Stories to Graphs • Work on Unit Plan Project <p>Assignment:</p>

		<ul style="list-style-type: none"> • Field Experience #2: Observing the Mathematical Environment • Article Review
#8, Oct. 17	<ul style="list-style-type: none"> • Investigations of Data, Probability, and Statistics • Virtual Manipulatives 	<p>Read:</p> <ul style="list-style-type: none"> • PSSM, Read the Data Analysis & Probability Standard, pp. 48- 51 and this standard for your favorite grade level <p>Activity:</p> <ul style="list-style-type: none"> • TBA • http://nlvm.usu.edu/en/nav/index.html • Work on Unit Plan Project
#9, Oct. 24	<ul style="list-style-type: none"> • Number and Operations 	<p>Read:</p> <ul style="list-style-type: none"> • PSSM, Read Number and Operations, pp. 32-36 and this standard for your favorite grade level <p>Activity:</p> <ul style="list-style-type: none"> • Video, Cubes and Containers; This Small House • Work on Unit Plan Project
#10, Oct. 31	<ul style="list-style-type: none"> • Assessment 	<p>Read:</p> <ul style="list-style-type: none"> • PSSM, Read The Assessment Principle, pp. 22-24 <p>Activity:</p> <ul style="list-style-type: none"> • The Blocks Task • Work on Unit Plan Project
#11, Nov. 7	<ul style="list-style-type: none"> • Literature and Mathematics 	<p>Read:</p> <ul style="list-style-type: none"> • Whitlin, D. (2004). Exploring Estimation through Children's Literature <p>Activity:</p> <ul style="list-style-type: none"> • TBA • Work on Unit Plan Project <p>Assignment:</p> <ul style="list-style-type: none"> • Article Review
#12, Nov. 14	<ul style="list-style-type: none"> • Art and Mathematics 	<p>Activity:</p> <ul style="list-style-type: none"> • Tessellations and Unit Origami <p>Assignment:</p> <ul style="list-style-type: none"> • Field Experience #3: Observing Student-Teacher Interactions
#13, Nov. 28	<ul style="list-style-type: none"> • Group Presentations on Units 	<p>Activity:</p> <p>Unit Presentations</p> <p>Assignment:</p> <ul style="list-style-type: none"> • Those who present will also turn in their units
#14, Dec. 5	<ul style="list-style-type: none"> • Group Presentations on Units 	<p>Activity:</p> <p>Unit Presentations</p> <p>Assignment:</p> <ul style="list-style-type: none"> • Those who present will also turn in their units

Course Expectations and Grade Requirements

Electronic Notebooks (Individual)

You will be required to maintain an electronic notebook for this course. Michael McKelvey, technical coordinator at MSTE, will be contacting you via email. Please direct all technical problems to Michael. On the course website, Michael will establish a folder for each person enrolled in this course. Please submit **all** of your assignments by dropping them into the folder. The primary purpose of the e-notebook is to create a virtual community for you and your colleagues. You are encouraged to take a look at your colleagues' field observations, lesson plans, etc. Many of the activities we do in class will serve you well when you begin teaching your own students. Your instructor will check your folders on an ongoing basis to monitor your progress. ***Stay up-to-date with your e-notebook. This requirement is factored into your attendance grade.***

Although you will be placing all assignments in your e-notebook, we all ask that you give your instructor a **hard copy** of each assignment on the day that it is due.

Many of the assignments will be completed in collaborative fashion. When this is the case, ***be sure that the name of every group member appears on the assignment.*** Each group member must keep a copy of the assignment—an electronic copy for the e-notebook and a saved computer copy. Every group member is responsible for each other's learning. This means that everyone must carry his or her share of the load. It is expected that group members will negotiate responsibilities and duties. In the rare instance that group dynamics become problematic, please see your instructor.

Attendance – 15%

Your active participation in each class session is an essential aspect of the learning process and your colleagues' learning as well. Your attendance is also an opportunity to demonstrate personal responsibility and collegiality, professional qualities that principals look for when hiring new teachers. You are expected to attend all the class meetings prepared to engage in active, collaborative participation, whether it is whole group discussion, collaborative group activity, or individual reflection. Preparation for class involves completion of assigned readings and tasks. If you are unable to attend a particular class session, please notify your instructor ***in advance***. In general with advance notice, your instructor will excuse ***no more*** than 2 absences. If serious illness or emergencies occur, please notify your instructor as soon as possible and follow university guidelines about such matters. Unexcused absences negatively impact your course grade. If you miss a class, it is your responsibility to obtain notes, materials, and assignments from other classmates first. See your instructor if you need assistance understanding the material. Excessive absences will result in an "F" for the course.

Field Exercises (Individual Effort) – 15%

Field experience observations and their accompanying exercises are an important part of the teaching practicum. It is important to record observations and reflections for ***all*** your field experiences; however, for the purposes of this course, you are responsible for

submitting only three formal observations. These exercises provide you an opportunity to connect the content learned in math methods courses with real teaching practices. Use PSSM to write your formal observations. It will ensure that you are using the professional language of mathematics educators. Make sure that you are making astute observations and that you incorporate your reflections. Be sure to jot down notes while you are in your placements. However, the exercises you submit for this course must be typed. Be sure that you title the paper appropriately. Your keen, well-written observations will be adequate responses.

Journal Article Review (Individual Effort) -- 20%

In this course you will be reading relatively short, practitioner-oriented articles. On the days that you have assigned readings, chose one article for which you will do an article review. Sometimes your instructor will choose the article for you. Though you will write on one article, you are still responsible for reading *all* of those assigned for that day.

The review should be typed, double-spaced, and no more than two pages, though your instructors hope that you will try to do this in *one* page. It should include (but not limited to) the following items:

- a. A one-paragraph summary of the article
- b. Identify the mathematics content addressed in the article
- c. Identify and discuss key points of the article related to learning and teaching the mathematics topic addressed
- d. Include your own reactions and informed opinion regarding the article

Standards Group Project -- 25%

The *Standards* Group Project allows you compare, contrast, and puzzle over the *Principles and Standards for School Mathematics* and the Illinois State Board of Education Learning Goals (or standards). The guidelines for this project will be given to you in class.

Unit Lesson Plan Group Project -- 25%

This project provides the opportunity to focus on the development of one mathematics topic over a period of two or more weeks. The outline for the unit plan will be given to you in class.

You are encouraged to meet with your instructor to discuss the quality of your work-in-progress or any other concerns about this course.

Evaluation and Related Course Policies

A core assumption of this course is that all enrolled participants will bring both an open mind and a critical disposition to schooling and mathematics teaching practices. Openness in this situation refers to a willingness to consider teaching in settings and grades beyond one's first preferences, as well as the capacity to find hidden opportunities in assignments, individuals, and settings whose parameters and/or apparent limitations were not expected. A critical disposition refers to an inquiring mind, recognizing both the

strengths and weaknesses of practices and situations and the capacity to question and evaluate one's own assumptions and past experiences. If your comments, interactions with others, and written work display open mindedness and a critical disposition, then your work will be favorably evaluated.

Another core assumption of this course is that all participants are responsible adults capable of (a) interacting with each other and with elementary students and school personnel in a professional and responsible manner, (b) being on time for class and field experiences, (c) being appropriately dressed, and (d) being prepared.

Be aware that if you do not conduct yourself in a responsible, professional manner, or if you are late for class or field experiences or are absent without notice or excuse, you risk your grade and your standing, not only in this course, but most likely in the program as well.

Make sure that you back up all of your work on a separate disk or a server. "The computer ate my homework" is not an acceptable excuse for missing assignments.

Late assignments will be accepted only with pre-approved consent of the instructor.

Grades will be based on the following general rubric.

Grade	Description	Percentage Range
A+	Consistent, timely preparation and attendance; thoughtful and substantial contributions to discussions and presentations; well-written, thoughtful, and substantive reflections and analytic papers	100
A		99-94
A-		93-90
B+	Consistent preparation and attendance; occasional contributions to discussions and presentation; and papers that "cover" the assignment	89-88
B		87-84
B-		83-80
C+	Inconsistencies in preparation and attendance; occasional contributions to discussions and presentations; and "thin" papers in quantity and/or quality	79-78
C		77-74
C-		73-70
D	Failure to attendance class regularly or contribute to discussions and presentations; unprepared for class; incomplete and missing assignments; poor writing ability. A "D" or "F" will be assigned according to the extent of the student's deficiencies	69-60
F		59-0

Due Date Reminder:

(All work is to be submitted electronically.)

Field Experience #1	The day your class meets for session #3
Field Experience #2	The day your class meets during the week of Oct. 10
Field Experience #3	The day your class meets during the week of Nov. 13
Article Review	See syllabus for these due dates
<i>Standards</i> Project	The day your class meets during the week of Sept. 26
Unit Plan Project	The day your group presents (Week of Nov. 28 or Dec. 5)

Academic integrity is an essential aspect of the scholarly endeavor. Be sure that you understand what this means with respect to your studies at the University of Illinois. Please refer to the *Code of Policies and Regulations Applying to All Students, Rule 33 – Academic Integrity*. Violation of this code will result in sanctions in accordance with University regulations.