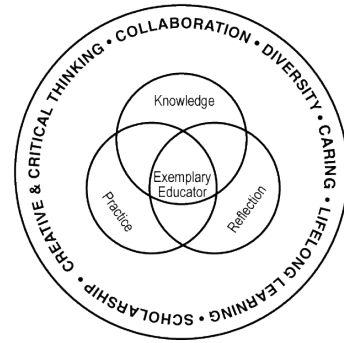


**METHODS OF INSTRUCTION IN THE
MATHEMATICS CURRICULUM
FOR THE MIDDLE SCHOOL
MATH 410, Fall 2011
Du Sable Hall 306 (Mathematics Education Lab)**



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Course Goals

In this course, you will explore the teaching of mathematics, investigating both what to teach and how to teach it. The purpose of this course is to begin inquiry into mathematics teaching and learning that will guide you in your first teaching experiences and give you tools that will enable you to continue to inquire and learn as part of your work as a teacher. Current national reforms in mathematics education recommend that middle school teachers think in new ways about the content of their instruction (what to teach) and pedagogy (how to teach). This course is intended to *launch you* as a learner and teacher of mathematics in ways that correlate with these reforms.

In this course, you will explore how students learn mathematics and what is meant by deep understanding of mathematics. You will learn how to teach mathematics so that learners see relationships and connections among mathematics topics and between mathematics and other subjects. You also will learn how to develop a learning environment that promotes learning mathematics with understanding. Specifically, you will:

- Understand the content, methods, and materials necessary to teach mathematics in the middle school.
- Learn about research on students' mathematical thinking and reform principles about teaching and learning mathematics.
- Learn how to build a learning environment that supports the teaching and learning of mathematics.
- Learn how to assess students' mathematical thinking and plan instruction based on that assessment.
- Learn to make instructional decisions about the use of curricular materials, such as textbooks, other print resources, manipulatives, and technology in the teaching of mathematics in the middle school.

Course Materials

Rubenstein, R. N., Beckmann, C. E., & Thompson, D. R. (2004). *Teaching and learning middle grades mathematics*. Hoboken, NJ: Wiley. **(Note: Make sure your copy has the CD with it.)**
National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author. **(Note: A 120-day free access to this document is available at nctm.org)**

Course Requirements

Attendance, Participation, and Mathematical Disposition. Attendance is an important part of your grade. Your active participation in each class session is vital to your learning as well as the learning of other students in the class. I expect you to attend all class meetings prepared and to be engaged as an active, collaborative participant during each class session, whether whole-class discussion, collaborative-group activity, or individual reflection is involved. Preparation for class includes completion of assigned readings and tasks. If you are unable to attend a particular class session, let me know before class. You are responsible for contacting someone in the class to find out what transpired in your absence. Assignments are to be submitted on time even if you are absent. Assignments are due at the beginning of the class period. Late assignments are scored at a maximum of half credit. Make-up exams may be scheduled only in the event of documented illness or emergency. You are expected to adhere to the classroom and testing procedures set forth for this class.

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Professional disposition is expected at all times. Learning mathematics extends beyond learning concepts, procedures, and their applications. It also includes developing a disposition toward mathematics and seeing mathematics as a powerful way for looking at situations (National Council of Teachers of Mathematics [NCTM], *Curriculum and Evaluation Standards for School Mathematics*, 1989, p. 233). Your mathematical disposition will be assessed using the recommendations of Standard 10 in the NCTM *Curriculum and Evaluation Standards*:

The assessment of students' mathematical disposition should seek information about their—

- confidence in using mathematics to solve problems, to communicate ideas, and to reason;
- flexibility in exploring mathematical ideas and trying alternative methods in solving problems;
- willingness to persevere in mathematical tasks;
- interest, curiosity, and inventiveness in doing mathematics;
- inclination to monitor and reflect on their own thinking and performance;
- valuing the application of mathematics to situations arising in other disciplines and everyday experiences;
- appreciation of the role of mathematics in our culture and its value as a tool and as a language.

Illuminations Assignment. You will select a lesson from this resource, write a report based on particular criteria, and prepare a ten-minute presentation for sharing in small groups of teachers in this class. You will receive detailed information on this assignment in class.

Interview of a Middle School Mathematics Teacher. You will interview a middle school mathematics teacher to gain insights into issues related to active teaching practice. You will receive detailed information on this assignment in class.

Questions for Student Interview and Report of Student Interview. You will first prepare to interview a middle school student to learn about the student's reasoning in a particular topic based on a reading from the CD for Units 1 or 2. You will submit the typed questions for the interview to me for feedback before you interview the student. After receiving feedback (and making corrections based on the feedback), you will interview a middle school student. In a typed report you will describe the students' understanding and suggest appropriate instruction based on this assessment. You will receive detailed information on this assignment in class.

Mathematics Lesson Plan, Teaching, and Reflection on Teaching. Working in a group with one or two other class members, you will select a lesson on a mathematics topic of your choice from a given selection of resources. You will develop the lesson for middle school students and adapt it into a 30-minute lesson that you will teach to our class. Your lesson should conform to the spirit of the *Principles and Standards for School Mathematics* (NCTM, 2000). This implies that the lesson should focus on development of conceptual knowledge, problem solving, and active student learning. You will prepare a detailed typed lesson plan that you will distribute to each class member. You will reflect on and evaluate your teaching in a typed report. You will receive detailed information on this assignment in class.

Reflective Writing. You will occasionally prepare short written assignments during or outside of class that are related to the assigned readings and class activities. These assignments are designed to encourage you to reflect on and extend your thinking about particular topics. Reflective writing assigned as part of a class session must be completed during class on the day given.

Curriculum Evaluation Project. Working in a group with one or two other class members, you will compare a lesson from a traditional middle school mathematics textbook and a lesson from a standards-based curriculum. You will evaluate how the lessons align with the framework of the *Principles and Standards for School Mathematics* (NCTM, 2000). You will receive detailed information about the typed assignment in class.

Resource Portfolio of Class Assignments and Materials. You will keep a 3-ring binder that contains completed assignments, all course handouts, and materials distributed by other class members. You will bring this binder to class on the assigned date.

Exams. You will complete two exams during the semester as scheduled on the syllabus. You will have access to manipulative materials that are available in the Mathematics Education Lab during the exams.

Final Exam. The final exam will be comprehensive. You must take the final exam with your fellow classmates at the scheduled time, which is **Thursday, December 8, 2011, at 4:00 – 5:50 p.m.** Location to be announced.

Evaluation

Your final grade will be determined as follows:

<u>Assignments and Tests</u>	<u>Percent of Total Grade</u>	<u>Points</u>
Attendance, participation, and mathematical disposition	10%	20
Illuminations assignment	4%	8
Interview of a middle school mathematics teacher	5%	10
Questions for student interview and report of interview	15%	30
Mathematics lesson plan, teaching, and reflection on teaching	15%	30
Reflective writing	5%	10
Curriculum evaluation project	10%	20
Resource portfolio of class assignments and materials	1%	2
Exams	15%	30
Final exam	20%	40

Grading Scale

A 90% - 100 % of point total B 80% - 89.9% of point total C 70% - 79.9 % of point total
D 60% - 69.9% of point total F Below 60%

Performance Standards for Student Work

Level

Standard to be Achieved for Performance at Specified Level

- A Fully achieves the purpose of assignments. Insightfully interprets assignments, extends beyond assignments, or raises thought provoking questions. Shows clear understanding of concepts. Communicates effectively.
- B Substantially completes purposes of assignments. Displays clear understanding of concepts, even though some less important ideas may be missing. Communicates successfully.
- C Purposes of assignments not fully achieved; elaboration needed. Displays understanding of major concepts, even though some less important ideas may be missing. Limits communication to some important ideas. Results may be incomplete or not clearly presented.
- D Important purposes of assignments not achieved; work may need redirection. Assumptions about the purposes may be flawed. Gaps in conceptual understanding are evident. Approach to assignments may lead away from successful completion. Results may be incomplete. Communication attempted.
- F Purposes of assignments not accomplished. Shows little evidence of appropriate reasoning. Presents fragmented understanding of concepts. Does not successfully communicate relevant ideas. Presents extraneous information.

Semester Schedule (Note: TLMGM is an acronym for your textbook.)

Week 1: August 23, 25

Unit 1—Creating a Learning Community/Mathematics Strand Reasoning with Patterns and Algebra: Sections 1.1 and 1.2

Assignment for August 25: TLMGM pp. 17-18 #15, 16, 17 and p. 27, #19—Read the cited pieces from *Principles & Standards* (A Vision for School Mathematics, Standards for Grades 6–8, Problem Solving Standards, Reasoning and Proof Standards) and prepare for discussion that focuses on the questions posed in TLMGM.

Week 2: August 30, September 1

Unit 1: Sections 1.3 and 1.4

Assignment for this week:

TLMGM p. 38 #14—Read the cited pieces from *Principles & Standards* (Algebra Standards) and prepare for discussion that focuses on the questions posed.

TLMGM p. 46 #8-11

Print, read, and be prepared to discuss M. C. Gilbert, “Applying the Equity Principle” (found on CD: Unit 1 Readings, 1.2 Gilbert) and TLMGM pp. 27-28 #21 (**Continued on next page**)

Print, read, and be prepared to discuss R. N. Rubenstein, “Building Explicit and Recursive Forms of Patterns with the Function Game” (CD: Unit 1 Readings, 1.3 Rubenstein) and TLMGM p. 38 #13

Week 3: September 6, 8

Unit 1: Sections 1.5, 1.6, 1.7

Assignment for this week:

TLMGM p. 56 #19—Read the cited pieces from *Principles & Standards* (Communication Standard) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss M. F. Chappell and M. E. Strutchens, “Creating Connections: Promoting Algebraic Thinking with Concrete Models” (CD: Unit 1 Readings, 1.5 Chappel) and TLMGM pp. 55-56 #16-18

Print, read, and be prepared to discuss C. Greenes and C. Findel, “Developing Students’ Algebraic Reasoning Abilities” (CD: Unit 1 Readings, 1.6 Greenes) and TLMGM pp. 65-66 #14-17

Due September 8: Illuminations Assignment

Week 4: September 13, 15

Unit 2—The Learning of Mathematics/Mathematics Strand Rational Numbers and Their Uses: Sections 2.1 and 2.2

Assignment for this week:

TLMGM p. 91 #25 and p. 103 #15—Read the cited pieces from *Principles & Standards* (Representation Standard and Connections Standards) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss S. J. Lamon “Presenting and Representing: From Fractions to Rational Numbers” (CD: Unit 2 Readings, 2.1 Lamon) and TLMGM p. 91 #23-24

Due September 13: Prepared fraction circles (following directions given in class)

Week 5: September 20, 22

Unit 2: Section 2.3

Assignment for this week:

Print, read, and be prepared to discuss B. J. Reys, “Promoting Number Sense in the Middle Grades” (CD: Unit 2 Readings, 2.3 Reys) and TLMGM p. 110 #10

Print, read, and be prepared to discuss M. F. Chappell and D. R. Thompson, “Modifying Our Questions to Assess Students’ Thinking” (CD: Unit 2 Readings, 2.3 Chappell) and TLMGM p. 110 #11

Due September 22: Reflective Writing I

Week 6: September 27, 29

Unit 2: Section 2.4

Assignment for this week:

TLMGM p. 120 #22—Read the cited pieces from *Principles & Standards* (Number and Operations Standards) and prepare for discussion that focuses on the questions posed.

Due September 29: Report of the Interview of a Middle School Mathematics Teacher

Week 7: October 4, 6

Unit 2: Sections 2.5, 2.6

Assignment for this week:

Print, read, and be prepared to discuss C. W. Langrall and J. Swafford, “Three Balloons for Two Dollars: Developing Proportional Reasoning” (CD: Unit 2 Readings, 2.5 Langrall) and TLMGM p. 127 #9

Print, read, and be prepared to discuss E. M. H. Billings, “Cocoa: Teaching Notes” (CD: Unit 2 Readings, 2.5 Billings) and TLMGM p. 127 #10

Print, read, and be prepared to discuss H. A. Khoury, “Exploring Proportional Reasoning: Mr. Tall/Mr. Short” (CD: Unit 2 Readings, 2.5 Khoury) and TLMGM p. 127 #11

October 6: Exam 1

Week 8: October 11, 13

Unit 3—Planning and Instruction/Mathematics Strand Geometry, Measurement, and Transformations: Section 3.1

Assignment for this week:

TLMGM p. 151 #16—Read the cited pieces from *Principles & Standards* (Measurement Standards) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss M. S. Smith and M. K. Stein, “Selecting and Creating Mathematical Tasks: From Research to Practice” (CD: Unit 3 Readings, 3.1 Smith) and TLMGM p. 151 #15

Due October 13: Report of Student Interview

Week 9: October 18, 20

Unit 3: Section 3.2

Assignment for this week:

Print, read, and be prepared to discuss J. Stenmark, “Asking Questions” (CD: Unit 3 Readings, 3.2 Stenmark) and TLMGM p. 162 #20

Due October 20: Reflective Writing II

Week 10: October 25, 27

Unit 3: Section 3.3

Assignment for this week:

TLMGM p. 162 #18—Read the cited pieces from *Principles & Standards* (Geometry Standards) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss M. L. Crowley, “The van Hiele Model of the Development of Geometric Thought” (CD: Unit 3 Readings, 3.3 Crowley) and TLMGM p. 174 #19-21

Due October 25: Curriculum Evaluation Project

Week 11: November 1, 3

Unit 3: Sections 3.4, 3.5 and 3.6

Assignment for this week:

TLMGM p. 199 #14—Read the cited pieces from *Principles & Standards* (Teaching Principle) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss M. K. Stein and M. S. Smith, “Mathematical Tasks as a Framework for Reflection: From Research to Practice” (CD: Unit 3 Readings, 3.6 Stein) and TLMGM p. 199 #13

Print, read, and be prepared to discuss M. F. Chappell and D. R. Thompson, “Perimeter or Area? Which Measure Is It?” (CD: Unit 3 Readings, 3.6 Chappell) and TLMGM p. 199 #15

November 1: Exam 2

November 3: Lesson Presentations

Week 12: November 8, 10

Unit 4—Assessment/Mathematics Strand Data Analysis and Probability: Section 4.1

Assignment for this week:

TLMGM p. 215 #13—Read the cited pieces from *Principles & Standards* (Assessment Principle) and prepare for discussion that focuses on the questions posed.

Print, read, and be prepared to discuss T. Belcher, G. Davila Coates, J. Franco, and K. Mayfield-Ingham, “Assessment and Equity” (CD: Unit 4 Readings, 4.1 Belcher) and TLMGM p. 215 #12

Lesson Presentations

Week 13: November 15, 17

Unit 4: Section 4.2

Assignment for this week:

Print, read, and be prepared to discuss J. S. Zawojewski and J. M. Shaughnessy, “Mean and Median: Are They Really So Easy?” (CD: Unit 4 Readings, 4.2 Zawojewski) and TLMGM pp. 229–230 #22 and 23

Print, read, and be prepared to discuss S. N. Friel and W. T. O’Connor, “Sticks to the Roof of Your Mouth” (CD: Unit 4 Readings, 4.2 Friel) and TLMGM p. 230 #24

Lesson Presentations

Week 14: November 22 (Thanksgiving Break begins November 23)

Unit 4: Section 4.3

Assignment for this week:

TLMGM p. 240 #11—Read the cited pieces from *Principles & Standards* (Data Analysis and Probability Standards) and prepare for discussion that focuses on the questions posed.

Due November 22: Reflection on Teaching

Week 15: November 29, December 1

Unit 4: Sections 4.4, 4.5, and 4.6

Assignment for this week:

Print, read, and be prepared to discuss R. J. Quinn, "Using Attribute Blocks to Develop a Conceptual Understanding of Probability" (CD: Unit 4 Readings, 4.5 Quinn) and TLMGM p. 254 #12

Print, read, and be prepared to discuss W. S. Bush, M. Bennion, L. Dworkin, L. Romagnano, and C. Ronchinsky, "Does This Count for Our Grade?" (CD: Unit 4 Readings, 4.5 Bush) and TLMGM p. 255 #13

Due November 29: Resource Portfolio

Final Exam: Thursday, December 8, 2011, at 4:00 – 5:50 p.m. Location to be announced.

Note: Changes and adjustments may be made to this syllabus when judged appropriate by the instructor. Such changes, should they occur, will be announced in class.

Students with Disabilities: NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. If you have not already done so, you will need to register with the Center for Access-Ability Resources (CAAR), the designated office on campus to provide service and administer exams with accommodations for student with disabilities. The CAAR office is located on the 4th floor of the University Health Services building (815-753-1303).

Academic Conduct: Academic honesty and mutual respect (among students and between instructor and students) are expected in this course. Academic misconduct, as defined by the Student Judicial Code, will not be tolerated. Professional disposition is expected at all times.

General Classroom Etiquette:

- Turn off pagers, phones, hands-free phones, PDAs, iPods, headsets, etc. before entering the classroom.
- No pagers, phones, hands-free phones, PDAs, iPods, headsets etc. can be used for any in-class work including quizzes, exams, and reflections.
- Plan to arrive on time, come prepared to class, stay to the end of class, and be in the classroom for the entire session, unless you have an emergency situation.
- Only students who are registered for this course should attend class sessions.
- Give your attention to the presenters during class, whoever they may be.
- Professional disposition is expected at all times.

Course Lab Fee: A lab fee charged for enrollment in this course is used to replace and update materials pertaining to instruction of the course and research on instruction of the course.