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 elementary 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:

- Develop knowledge of the content, methods, and materials necessary to teach mathematics for Grades K–6.
- Learn about research on children’s 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 to consider the different characteristics of diverse students to support their 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 elementary school mathematics.

This course aligns with principles of reflective inquiry.

Required Materials
- Math 402 Packet (download from Blackboard)
- Additional readings furnished or requested by the instructor

Course Requirements
*Attendance, Participation, and Mathematical Disposition.* Attendance is an essential part of your participation in this course. Active participation in each session is vital to your learning as well as the learning of other students in the course. You are expected to attend all class sessions 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 sessions includes completion of assigned readings and tasks.
If you are unable to attend a particular class session, contact your instructor before class. You are responsible for contacting someone in the course 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 session. Late assignments are scored at a maximum of half credit. Make-up quizzes 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 section of Math 402. You are expected to take the Final Exam for this course at the scheduled date and time.

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; and
- appreciation of the role of mathematics in our culture and its value as a tool and as a language.

Mathematics Computation Test. You will take a basic skills test during the third week of the course. The test assesses your knowledge of whole numbers, fractions, decimals, ratio, proportion, and percentage. Download a practice copy from the course Blackboard page. A minimum score of 80% is required for a grade of C or better in the course.

Professional Collaboration, Practice, and Reflection: Mathematics Lesson Plan, Implementation, and Reflection on Teaching. Working individually or with a partner, and through collaboration with your clinical classroom teacher, in this core assignment you will plan and teach a problem-solving and reasoning-based lesson to students in your clinical setting. Your goal is for the lesson to develop concepts from a mathematics topic of choice that is consistent with the needs of the student. [Note: Lesson topics of coins, time, procedures, and practice are excluded.] You will engage students in problem solving and reasoning, and you will use appropriate supportive technology and/or instructional materials. Your lesson plan and teaching will conform to the spirit of the Principles and Standards for School Mathematics (NCTM, 2000), Principles to Actions: Ensuring Mathematical Success for All (NCTM, 2014), and the Illinois Learning Standards, consistent with the Common Core State Standards-Mathematics (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). Following your teaching of the lesson, your clinical classroom teacher will complete an evaluation form on your teaching and return it directly to the instructor. You will individually complete a reflective inquiry writing assignment in which you will consider changes to improve the lesson.

Professional Practice and Reflection: Student Interview Assignment. Working individually, in this core assignment you will use an informal assessment instrument to explore one elementary school student’s understanding of whole number or rational number operations or use of algebraic reasoning. You will interview the student, and through reflection on the findings of the interview, you will describe and interpret the student’s understandings and misconceptions, and suggest an instructional experience to address a single misconception or knowledge gap that you observed. Keep in mind that the selected instructional experience is to be closely connected to your assessment observations.

Professional Collaboration, Practice, and Reflection: Curriculum Analysis Project. You will examine and analyze a mathematics lesson from an instructor-approved resource. You will write a one-paragraph summary of the lesson. Then you will analyze the lesson with respect to the Illinois Learning Standards, consistent with the Common Core State Standards-Mathematics (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

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.
Professional Resources: Children’s Literature Review. You will select a children’s book about mathematics from the set of books in the Mathematics Education Lab. You will write a review of the book based on given criteria and prepare a five-minute presentation for sharing in small groups of classmates. You will receive detailed information on this assignment in class.

Professional Resources: Illuminations Assignment. You will select a lesson from the Illuminations web site, write a report based on given criteria, and prepare a five-minute presentation for sharing in small groups of classmates. You will receive detailed information on this assignment in class.

Professional Practice and Reflection: Reflective Writing. You will occasionally prepare short written reflections during or outside of class that are related to the assigned readings and course 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 the class session on the day given.

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, May 12, 8:00 - 9:50 AM. Location to be announced.

Evaluation
Final course grades will be determined according to point totals accumulated during the semester as noted in the table below and to the following requirements: In order to receive a final grade of “C” or higher for the course, a student must (1) complete all assignments; (2) complete the Mathematics Computation Test with a grade of 80% or higher;* and (3) complete all core assignments with a grade of “C” or higher.**

<table>
<thead>
<tr>
<th>Assignments and Tests</th>
<th>Percent of Total Grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance, Participation, and Mathematical Disposition</td>
<td>5%</td>
<td>10</td>
</tr>
<tr>
<td>Mathematics Computation Test*</td>
<td>0%*</td>
<td>0*</td>
</tr>
<tr>
<td>Mathematics Lesson Plan, Implementation, Reflection on Teaching**</td>
<td>15%</td>
<td>30</td>
</tr>
<tr>
<td>Student Interview Assignment**</td>
<td>15%</td>
<td>30</td>
</tr>
<tr>
<td>Reflective Writing</td>
<td>6%</td>
<td>12</td>
</tr>
<tr>
<td>Children’s Literature Review</td>
<td>4%</td>
<td>8</td>
</tr>
<tr>
<td>Illuminations Assignment</td>
<td>5%</td>
<td>10</td>
</tr>
<tr>
<td>Exams</td>
<td>20%</td>
<td>40</td>
</tr>
<tr>
<td>Curriculum Analysis Project</td>
<td>5%</td>
<td>10</td>
</tr>
<tr>
<td>Final exam</td>
<td>25%</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>200</td>
</tr>
</tbody>
</table>

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

Performance Standards for Student Work
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.
Semester Schedule

Week 1: January 18, 20
January 18: No classes at NIU in honor of Martin Luther King
Chapter 1 Teaching Mathematics in the 21st Century
Chapter 2 Exploring What It Means to Know and Do Mathematics
What is involved in teaching elementary school mathematics? What are the recent reforms in mathematics education? What does it mean to know and do mathematics? What does it mean when we say that each person constructs his/her own knowledge? What does it mean to understand mathematics? What are key dimensions of a learning environment that help students understand mathematics?

Week 2: January 25, 27
January 27: Bring to class your COMPLETED copy of the Practice Mathematics Computation Test
January 27: Bring to class your own PRINT copies of Math 402 Course Packet to class (download from Blackboard)
January 27: Bring your own PRINT copies of pp. 88–89 of the Common Core State Standards-Mathematics (download from Blackboard)
Due January 27: Reflective Writing I
Chapter 8 Developing Early Number Concepts and Number Sense
What is number sense? What is a number? What is conservation of number? What is a numeral? What kind of tasks can help students connect numbers to real-world situations? What kinds of tasks can help students use early number relationships to develop early mental computation?
Chapter 9 Developing Meanings for the Operations
How do children learn addition and subtraction? What are the types of addition and subtraction problems? What solution strategies do children use to solve these types of problems? How does students’ choice of solution strategies facilitate assessment of children’s mathematical thinking? How is this assessment related to teaching? How do children think about multiplication and division? What are the types of multiplication and division problems? What solution strategies do children use to solve these types of problems?

Week 3: February 1, 3
February 1: Mathematics Computation Test
Due February 3: Professional Resources: Illuminations Assignment
Chapter 10 Developing Basic Fact Fluency
What are basic facts? What is mastery of basic facts? What is an efficient strategy? When is it appropriate to use drill and how can it help? What are some reasons to avoid using timed tests as a means of learning basic facts? What are some ways to help older children who have not learned basic facts?

Week 4: February 8, 10
Due February 10: Professional Resources: Children’s Literature Review
Chapter 11 Developing Whole-Number Place Value Concepts
Chapter 12 Developing Strategies for Addition and Subtraction Computation
Chapter 13 Developing Strategies for Multiplication and Division Computation
What is place value? What is the importance of place value in whole number operations? What are equivalent representations? How would you describe good place-value number sense?
How can we elicit and discuss the various methods students use to solve problems?

Week 5: February 15, 17
Due February 17: Reflective Writing II
Due February 17: Prepared Fraction Circles (following directions given in class)
Chapter 13 Developing Strategies for Multiplication and Division Computation
Chapter 15 Developing Fraction Concepts
Chapter 16 Developing Fraction Operations
How can we elicit and discuss the various methods students use to solve problems?
What is a fraction? How do children learn fractions? What are the possible representations to use with fractions?
What are the advantages and limitations of particular representations? How do you gather information about students’ understandings of fractions?
Week 6: February 22, 24

**February 24: Exam on Place Value**
Chapter 16 Developing Fraction Operations
Chapter 17 Developing Concepts of Decimals and Percents

*What should be emphasized in order for children to develop good number sense with decimals? What is the relationship between fractions and decimals? What is the relationship between decimals and percents?*

Week 7: February 29, March 2

**Due March 2: Interview/Assessment Report and Reflection**
Chapter 4 Planning in the Problem-Based Classroom
Chapter 5 Creating Assessments for Learning
Chapter 6 Teaching Mathematics Equitably to All Children

*What is the teacher’s purpose or agenda before, during, and after a lesson? How do we reach all children when we teach mathematics? How do we assess children’s mathematical thinking? How do we gather information from students about what they understand? What do we do with the information we gather? How is assessment related to teaching?*

Week 8: March 7, 9

**March 7: Exam on Fraction Operations**
Chapter 14 Algebraic Thinking: Generalizations, Patterns, and Functions

*What is algebraic reasoning? What are beginning algebra concepts? What is the role of patterns in learning algebra? How does algebra relate to the real world?*

**Spring Break March 13-20**

Week 9: March 21, 23

**Due March 21: Good Draft of Lesson Plan**
Chapter 20 Geometric Thinking and Geometric Concepts

*What does it mean to think geometrically? What are the van Hiele levels of geometric learning and how are they useful? How can we assess students’ spatial sense and geometric reasoning?*

Week 10: March 28, 30

**Due March 28: Final Lesson Plan**
Chapter 19 Developing Measurement Concepts

*What concepts of measurement should elementary students understand? How do children learn measurement concepts? What is the role of estimation in learning measurement?*

Weeks 11 and 12: April 4-15 Clinical Experience in YourAssigned Schools
- Teach mathematics lesson previously approved by the instructor—**no exceptions**
- Write your Reflection on Teaching for the lesson taught during your clinical experience
- Observation report from the clinical classroom teacher is due immediately after teaching the lesson. (Send to the instructor via U. S. mail in the provided envelope. Must be received by Friday, April 22)

Week 13: April 18, 20

**Due April 18: Reflection on Teaching for the lesson taught during your clinical experience**
Chapter 7 Using Technological Tools to Teach Mathematics

*What are the benefits of using calculators in mathematics instruction? How do you address common misconceptions about calculator use? How might computers be used as a tool in mathematics instruction? What are some good criteria for selecting and using software?*

**Due April 20: Reflective Writing III**

Week 14: April 25, 27
Chapter 18 Proportional Reasoning
Chapter 21 Developing Concepts of Data Analysis
Chapter 22 Exploring Concepts of Probability

**Due April 27: Curriculum Evaluation Project**
Final Exam: Thursday, May 12, 8:00 - 9:50 AM. 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.

Qualified Students with Disabilities

Northern Illinois University abides by Section 504 of the Rehabilitation Act of 1973, which mandates reasonable accommodations be provided for qualified students with disabilities. If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. If you have a disability and may require some type of instructional and/or exam accommodation, please contact your instructor privately as soon as possible in the semester so the instructor can assist you in achieving your learning goals in this course. The DRC coordinates accommodations for students with disabilities. the designated office on campus to provide service and administer exams with accommodations for students with disabilities. The DRC is located on the 4th floor of the NIU Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.

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.

Connection to TLEE 383

Students whose placements in TLEE 383 are terminated will not be permitted to continue in any third professional semester course (e.g., MATH 402) for which the required clinical assignment/s has/have not be completed.

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.

General Classroom Etiquette

- Please set your cell phone to vibrate during class and only use your cell phone when it is a true emergency.
- Phones, laptops, and tablets, and other electronic devices can be used for in-class work, except when requested by the instructor (e.g., when asked to bring print copies; during exams; and in-class reflections).
- No audio recording or videotaping is allowed, except in cases of special accommodations documented by the NIU Disability Resource Center.
- Arrive on time, come prepared for 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.