MAT220 Mathematics for Teachers P–8 Spring 2015

Course Description: Development of numeration systems, number sense and number relationships, concepts of whole-number and rational-number operations, number theory, estimation, statistics and probability. Modeling of effective mathematical pedagogy for children, emphasizing the development of patterns and relationships and the view of mathematics as solving problems, communicating, reasoning and making connections **(**3 semester credit hours).

Textbook: Elementary & Middle School Mathematics (w/out Field Exp Guide); Van de Walle, 8th, Paper, 9780132612265

Purpose of the Course: This course is designed to provide prospective elementary and middle school teachers with mathematical and pedagogical understanding of grade appropriate mathematical content areas. Effective mathematical pedagogy for children will be modeled that emphasizes the development of patterns and relationships, problem solving, communicating, reasoning, and making connections

Recommended Additional Texts and Online Resources:

Membership to National Council of Teachers of Mathematics (NCTM) with a subscription to *Mathematics Teaching in the Middle School*. Membership also provides complete access to *Principles and Standards for School Mathematics* (2000). www.nctm.org

NCTM (2000). *Principles and Standards for Schools Mathematics*. Reston, VA: Author. (Free trial available online through nctm.org)

NCTM (2006). *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence.* Reston, VA: Author.

NCTM Illuminations. *Resources for Teaching Math.* [Online searchable database].

National Governors Association Center for Best Practices & Council of Chief State School Officers (2012). *Common core state standards for mathematics*. Washington, DC: NGACBP & CCSSO. http://www.corestandards.org/Math/

Various curriculum materials will be provided for students' use during the semester.

Student Learning Outcomes

Upon completion of the course, the pre-service teachers (PSTs) will be able to:

- Discuss basic concepts in the elementary & middle school mathematics curriculum, focusing on sets of numbers (rational and integers), measurement, statistical reasoning, graphs, and functions. (InTASC: 1,

NCTM: Content Strands)

- Relate elementary & middle school mathematics concepts to the NCTM Principles & Standards and Common Core Georgia Performance Standards (CCGPS). (InTASC: 2, 3, 4, 6, 8; NCTM: Principles and Standards)
- Evaluate and discuss pedagogical aspects associated with the development of particular concepts and principles. (InTASC: 1, 2, 3, 4, 6; NCTM: Teaching Principle)
- Discuss the problem-solving process and identify levels of cognitive demanding tasks. (InTASC: 2, 3, 4; NCTM: Problem Solving Standard)
- Reflect on becoming a mathematics teacher. (InTASC: 9, NCTM: Teaching Principle)
- Communicate and reason mathematically, solve problems, investigate different representations, and make mathematical connections as discussed in the NCTM Standards. (InTASC: 2, 3, 4; NCTM: Communications Standard, Connections Standard, Reasoning and Proof Standard, Problem Solving Standard, Representation Standard).
- Demonstrate operational familiarity with how technology tools can support teaching and learning mathematics. (InTASC: 4, NCTM: Technology Principle)
- Discuss relevant research and literature. (InTASC: 1, 2, 3, 4, 6, 8: NCTM: Teaching Principle)

Course Policies: All students are expected to abide by the following rules:

Attendance Policy: All students are expected to attend class every day. If you are not in class on any given day, it is your responsibility to **notify me in advance (via email)** and make arrangements to make up any material you might have missed. It will be difficult to do well in the course when you miss class. Attendance will be taken daily[1] and absences in excess of three (3) days will result in a deduction of 0.5% per additional absence from your overall course grade point average for the course.

Academic Integrity: Standards governing the professional and ethical conduct of all students are outlined in the Viking Code, the student handbook. Students must respect the right of other individuals to express their views and opinions and must properly recognize the work of others. All work that you turn in must be your own. As a professional learning community, you are encouraged to discussed concepts with other students, but you may not copy their work or allow them to copy yours. If you are not sure about whether something falls under the umbrella of "academic dishonesty," please ask. Cheating is not a victimless crime; it undermines your education and devalues the trust placed in you by your peers and the instructor. Student behavior that violates the Viking Code standards may be subject to disciplinary action including removal from the program. Any unauthorized collaboration on an exam will result in a grade of zero (0) for the exam and possibly a grade of F for the course.

Classroom Professionalism: Distractions take many forms. I am a big proponent of technology in learning/teaching. Laptops/Tablets are only permitted as they pertain to class activities, which I hope occurs regularly and professionally. Cell phones should be turned off (or on vibrate, if absolutely necessary), and out of sight. If you have a reason to respond to a phone call or text message, you need to quietly excuse yourself from class and address the personal emergency outside the classroom. If you need a calculator or timepiece during an exam or quiz, bring one; cellphones are not allowed to support quiz/exam needs.

Use of Technology: The use of calculators and computers is an encouraged and accepted practice to enable students to discover mathematical relationships and approach real world applications. The use of a variety of technological tools is an integral part of mathematics courses for teaching and learning. During the first week of class, each student needs to activate his/her Berry e-mail account. Students will be expected to obtain course materials and information from the Internet and Viking Web.

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1 As required by Berry College policy.

Methods of Instruction: As mathematical content is developed, the emphasis will be on investigating, inquiring, problem solving, reasoning, and communicating. Rather than "one-way lectures," the instruction will be characterized by interaction. Many opportunities will be given to explore various mathematical concepts using various learning tools including technology and explanation. Reflection on experiences both pertaining to the mathematical content and pedagogical issues will be encouraged.

Classroom Activities: In preparation for your career in a highly collaborative profession, we will spend significant class time working as a whole-class or small groups. More often than not class time will be devoted to activities in small groups. Educational research shows that active learning produces a higher level of understanding and retention than the traditional lecture method. Assignments will be due at the beginning of the class session as posted on the VW.

Questions and Explanations: There is more than one right way to explain how to do anything. I will do my best to help you understand the course material, which includes regular classroom discourse to practice our explanations of the mathematics. This practice should take place among all classroom members.

Preparation: You should be prepared to spend at least two hours of diligent work on your own outside of class for each hour spent in class. There is no easy road to learning, regardless of the subject matter. I encourage students to set up a weekly homework session where they share questions and ideas with fellow students outside of the regular class time. If you are unprepared to commit the necessary time to learning, then you are setting yourself up for failure.

Office Hours: If you find yourself having trouble with the concepts or the homework, please schedule a time to talk to me in my office. If you would like, the math department also provides a tutoring center where other students will be able to answer questions about math. This is in room MAC 348. As a warning, this group may NOT be as helpful for questions about math education (pedagogical/conceptual) as their knowledge is typically restricted to computational mathematics.

Assessment/Evaluation Components and Grading Scale:

Each assessment detailed below will contribute to your overall grades for the course (1000 total points). Your current grade will be continuously updated on Viking Web. Regularly check that your records and my records match.

Course Grade	Cumulative Points Earned
A	930–1000 points
A–	900–929 points
B+	880–899 points
B	830–879 points
B–	800–829 points
C+	780–799 points
C	700–779 points
D	600–699 points
F	< 600

Assessment Measures: Your grade is performance-based and will be determined using the following measures:

Assignment	Max Points Available
Reading IQRs (10: 10 pts. each)	100
Mathematics Autobiography	30
TED Video & iMap Video Reflections (2: 15 pts. each)	30
Reading Quizzes (8: 10 pts each; 9 given – 1 dropped)	80
Problem Sets (8: 20 pts. Each)	160
Cognitive Demand Project	80
Mathematics Center Portfolio & Presentation	70
Quizzes (2: 30 pts. each)	60
Exams (2: 120 pts. each)	240
Final Exam	150
Total =	1000

Reading IQRs (Idea + Question + Reflection) = 100 Points

You are expected to read all assigned readings before class. We will spend several classes discussing assigned readings. You should bring to class your questions, doubts, comments, or ideas that come up during your reading. More specifically, for every reading you should write: one Idea to guide our class discussion, one Question, and one Reflection (1–2 paragraphs). This reflection should be written in first person (examples: "I think/believe the importance of this article …", "I disagree with the authors because…", or "I wonder if students are …"). It is through sharing that we increase our understanding of the concepts discussed in class. Readings will be available on VikingWeb.

Mathematics Autobiography = 30 Points

The purpose of this assignment is for you to reflect on your experiences as a mathematics learner and to write your own mathematics autobiography. (1) What has been your experience thus far with math? (2) What types of teaching and learning worked best/worst for you? (3) How do you think this has had an impact on you? (4) What are your hopes and fears for this process of transforming yourself into a mathematics teacher? Prepare your Math Autobiography as a 2-page Word (.doc or .docx) document (double spaced, font = New Times Roman, size = 12) that you will submit through Viking Web.

Video Reflections = 30 Points

These reflections will require you watch a specified video and respond to a set of questions. Your Video Reflections should be typed in Word format, and uploaded in VW. More information will be provided in class.

Reading Quizzes = 80 Points

Reading quizzes will be given throughout the course. Advance notice will be provided, as they are posted on the course Pacing Guide (available on VW). These reading quizzes will include 5 multiple choice or short answers. Content will be pulled directly from the reading. Nine (9) reading quizzes will be given; eight (8) of them will count toward your course grade (1 dropped).

Problem Sets (HW Problems) = 160 Points

This course has 8 problem sets (20 points each). These problem sets are detailed on the Pacing Guide available on VW. You will find this course involves a lot more writing and drawing than other math courses. Your text-based responses (i.e., narrative explanations) **need to be typed**. Handwritten responses will not be accepted. Labels on math drawings can be handwritten. You are welcome to either scan and upload your drawings or bring a paper copy to class on the due date. You are encouraged to work with others in exploring the homework questions. You are also held accountable for submitting original work. That means, your homework is YOUR work, not a copy of someone elses.

Cognitive Demand Project = 80 Points

Working in Groups of 3 – 4 people, Evaluate current level status of 4 different tasks and then Revise these 4 tasks to the "Doing Mathematics" level. Detailed assignment instructions to be provide in class.

Design a Mathematics Center (Presentation and Portfolio) = 70 Points

Working in groups of 3-4 students, you and your partners will select a mathematics topic and grade level to design a mathematics center. The center will include three (3) different activities that children can work on to explore your given mathematical topic. During our course and based on your experiences in the schools, you will select activities for your center. For each activity, you will complete an activity briefing (see template on VW). Additionally, each participant will prepare a 2-page reflection on the overall assignment. On one of these three days: **April 20, April 22, or April 24, 2015,** your group will share your center with the class. Each group will have 20 minutes to present/demonstrate all 3 activities. More information will be provided in class.

Examinations (Quizzes/Exams/Final Exam) = 450 Points (= 30 + 30 + 120 + 120 + 150)

This course includes both a midterm exam and a comprehensive final exam.

Late work: Late work will only be accepted in cases where arrangements are made with me prior to the due date/time or in extreme cases where arrangements are made afterward. If arrangements are made, then class assignments may be turned in late with 10% grade reduction for each day late. Exams will be handled on a case-by-case basis.

Field Experience

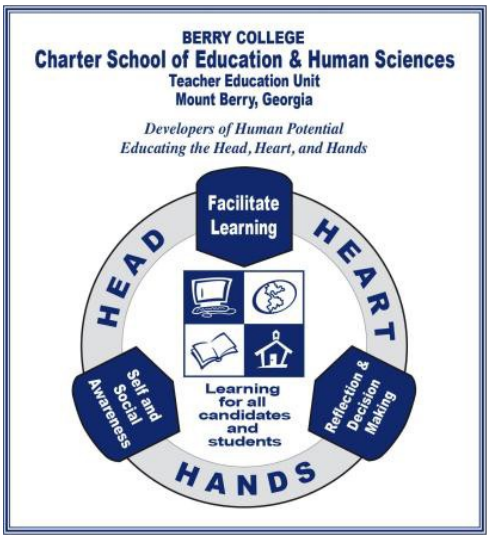
No field experience will be required for this class.

Accommodation Statement: Students with disabilities who believe that they may need accommodation in this course are encouraged to contact the Academic Support Center in Krannert Room 329 (ext. 4080) as soon as possible to ensure that such accommodations are implemented in a timely fashion. No student will receive special accommodations without approval from the Academic Support Center.

Class Schedule: Monday, Wednesday, and Friday: 1:00pm – 1:50pm

This syllabus is subject to change. Such changes will be announced in class.

The Berry College Learning Community believes that teachers are **"Developers of Human Potential."** Like Martha Berry, we believe the role of excellent teachers is to help our candidates and the students they teach to reach their full potential by developing their **head, heart and hands**. Our philosophy and purposes are based on three dimensions to develop teachers and educational leaders who **1) Promote Reflection and Decision Making (head), 2) Facilitate Learning (hands)** , and **3) Enhance Self and Social Awareness (heart)** . Each of these dimensions is tied to one or more of the 10 program principles and is demonstrated by our candidates in the coursework, field and clinical experiences.



Applicable Teacher Education Program Interstate Teacher Assessment and Support Consortium (InTASC) Principles:

1. **Subject Matter (Head):** The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of subject matter meaningful for students.
2. **Student Development & Learning (Head):** The teacher understands how children learn and develop and can provide learning opportunities that support their intellectual, social, and personal development.
3. **Adapting Instruction for Individual Needs (Head).** The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
4. **Multiple Instructional Strategies.** The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
6. **Communication (Head):** The teacher uses knowledge of effective verbal, nonverbal and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
8. **Assessment of Student Learning (Hands):** The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.
9. **Professional Commitment and Responsibility (Heart):** The teacher is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

The NCTM Core Principles and Standards that will guide this course are:

Learning Principle: Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge. All students can learn mathematics.

Teaching Principle : Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well. It requires knowing and understanding mathematics, students as learners, pedagogical strategies, and ways to create a supporting classroom learning environment.

Assessment Principle: Assessment should support the learning of important mathematics and furnish useful information to both teachers and students. It should enhance student learning and be used to make instructional decisions.

Equity Principle: Excellence in mathematics education requires equity – high expectations and strong support for all students, it requires accommodating difference to help everyone learn mathematics.

Technology Principle : Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

Problem Solving Standard: By learning problem solving in mathematics, students should acquire ways of thinking, habits of persistence and curiosity, and confidence in unfamiliar situations that will serve them well outside the mathematics classroom.

Reasoning and Proof Standard: Being able to reason is essential to understanding mathematics. By developing ideas, exploring phenomena, justifying results—with different expectations of sophistication—at all grade levels, students should see and expect that mathematics makes sense. Building on the considerable reasoning skills that children bring to school, teachers can help students learn what mathematical reasoning entails.

Communication Standard: When students are challenged to think and reason about mathematics and to communicate the results of their thinking to others orally or in writing, they learn to be clear and convincing. Listening to others' explanations gives students opportunities to develop their own understandings. Conversations in which mathematical ideas are explored from multiple perspectives help the participants sharpen their think and make connections.

Connections Standard*:* When students can connect mathematical ideas, their understanding is deeper and more lasting. They can see mathematical connections in the rich interplay among mathematical topics, in contexts that relate mathematics to other subjects, and in their own interests and experience.

Representation Standard: Some forms of representation—such as diagrams, graphical displays, and symbolic expressions—have long been part of school mathematics. Representation should be treated as essential elements in supporting students' understanding of mathematical concepts and relationships; in communicating mathematical approaches, arguments, and understandings to one's self and to others; in recognizing connections among related mathematical concepts; and in applying mathematics to realistic problem situations through modeling.

Adapted from PSSM (NCTM, 2000)

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