

George Mason University
College of Education and Human Development
Secondary Education Program
EDCI 472: Advanced Methods of Teaching Mathematics in the Secondary School



Promoting Learning & Development Across the Lifespan

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Mathematics classrooms are more likely to be places in which mathematical proficiency develops when they are communities of learners and not collections of isolated individuals.
(Kilpatrick, Swafford, and Findell, 2001)

All students should have access to an excellent and equitable mathematics program that provides solid support for their learning and is responsive to their prior knowledge, intellectual strengths, and personal interests.

Assessment should not merely be done to students; rather, it should also be done for students.
(NCTM, 2000)

Purpose of the Course

In *Teaching Mathematics in the Secondary School* course you thought about what it means to *understand* mathematics, were introduced to learning theories, became familiar with standards documents, and learned about characteristics of mathematics instruction that fosters deep understanding of and proficiency in working with mathematics. As a culminating event, you had the opportunity to apply all that you had learned toward the design of a unit plan.

In this course, *Advanced Methods of Teaching Mathematics in the Secondary School*, you will have the opportunity to learn more about four aspects of mathematics teaching: managing classroom discourse, differentiation, use of technology, and assessment. As indicated by the quotes listed above, you will explore these aspects of mathematics teaching while keeping a focus on student thinking and learning. Regardless of whether a teacher is engaging with the class, differentiating instruction, or conducting an assessment, the teacher must focus on the development of student thinking about mathematics. You will learn how to do this in this class. This will help you as you embark upon Internship and your first teaching position! ☺

Course Description as provided in the Course Catalog

This course emphasizes developing different styles of teaching and covers curricula, current issues, and research literature in secondary school mathematics. School-based field experience required.

Pre-requisites:

EDCI 372

Objectives

Success in this course is measured by the degree to which you are able to:

- demonstrate an ability to critique classroom discourse and the role of the teacher in facilitating that discourse through reference to findings from research on student learning (NCTM SPA Standard 3; NCTM SPA Indicators 7.3, 7.4, 8.6; CEHD Core Values of Collaboration and Research-Based Practice)
- demonstrate an ability to plan and a mathematics lesson that fosters deep understanding of mathematics content for *all* students (NCTM SPA Indicators 7.1, 7.2, 7.3, 7.4, 8.1, 8.4, 8.6, 8.7 and 8.8; CEHD Cores Values of Innovation, Research-Based Practice and Social Justice)
- plan a mathematics lesson that includes elements of differentiation, assessment, and technology, is problem-based, requires students to engaging in sense making, and engages students in mathematical communication while adhering to state and national standards (NCTM SPA Standards 1, 2, 3, 6, 7, and 8; CEHD Core Values of Innovation, Research-Based Practice, and Social Justice)
- develop assessments that give a teacher insight into student thinking about mathematics content (NCTM SPA Indicators 7.5 and 8.3)

Plan for the Course

We will address the objectives as we progress through the course, which is organized into four sections:

I. Managing Classroom Discourse

In this part of the course you will critique and learn more about teacher decisions in managing whole-class mathematical discussions. You will learn more about questioning and will consider appropriate times to ask particular questions. Then, later in the course, you will have the opportunity to practice managing a conversation when you teach a full lesson to the class.

II. Assessment

In this final section of the course you will consider the role of assessment in a mathematics classroom and will learn more about ways that teachers might gain insight into student thinking about mathematics.

III. Differentiation

In this final section of the course, you will become familiar with strategies for differentiating mathematics instruction. By focusing on student thinking, you will learn how to meet student needs while holding them to high standards.

IV. The Responsibility of the Teacher in Today's Schools

In this final section of the course you will consider the role of a *mathematics* teacher in today's world. You will consider your responsibility to the diverse group of students you will be teaching and to the surrounding community.

Textbooks and Materials

Daily access to the following materials is required:

Brahier, D.J. (2009). *Teaching secondary and middle school mathematics* (3rd edition). Boston: Pearson Education Inc.

Brahier, D. J. (2001). *Assessment in middle and high school mathematics: A teacher's guide*. New York: Eye on Education.

Dodge, J. (2005). *Differentiation in action*. New York, NY: Scholastic.

Additional readings as assigned.

Course Expectations/Assignments

The following assignments will help you (and me) to gauge your development throughout the course:

| Assessment | Due Date | Percentage of Grade |
|-------------------------------|---------------|---------------------|
| Participation and Preparation | | 15% |
| Assessment Assignment | Nov. 28, 2012 | 20% |
| Micro-Teaching | | 25% |
| Field Work Assignment | Dec. 5, 2012 | 15% |
| Unit Plan Assignment | Nov. 14, 2012 | 25% |

Participation and Preparation

The participation of each class member is vitally important. If you do not come prepared to discuss the readings, to share your work on a given assignment, and to participate in the activities of the day the entire class will suffer. You **must** commit to be coming to every class on time, being prepared for the evening's activities, and being ready to participate. You can expect that, in addition to work on the larger projects outlined below, there will be weekly readings and assignments that will fall into this category. If, however, there is an emergency and you cannot make it to class, you **must email me ahead of time** and submit all assignments electronically before the end of class.

Unit Plan and Presentation

Throughout this semester, you will explore many issues related to the teaching and learning of mathematics. In this culminating assignment, you will have the opportunity to use the knowledge, skills, and understandings you've gained in this and the previous semester in the creation of a complete unit of study. Within this unit plan, you will be asked to design lessons that pay attention to the use of technology, the development of student understanding of mathematics content, various standards documents, assessment of student understanding, and ways to differentiate instruction for diverse groups of learners. After submission of the unit plan, you will present your plan to your peers so that the entire class can begin to create a collection of teaching ideas for various content areas within secondary mathematics. **[The requirement for this assignment differs for graduate and undergraduate students] You must pass this assignment to continue in the program.**

Assessment Assignment

In this assessment, you will apply what you learned about assessment to your unit plan. Building on what you learned, you will further develop your assessment plan for the unit and, in so doing, develop two assessment instruments and corresponding grading rubrics. One assessment will be a quiz assessing the goals and objectives from one of the lessons in your unit plan. Another assessment will be an alternative form of assessment used to assess the goals and objectives of the unit.

Micro-Teaching Assignment

In this assignment, you will apply all that you learned about planning and orchestrating classroom discourse to the development, implementation, and reflection upon a lesson surrounding a mathematics concept covered in secondary mathematics classrooms. The lesson topic will be assigned by the instructor. The implementation of the lesson will be video-recorded so as to facilitate the reflection process. This process is valuable to you as you teach and reflect on your teaching of a lesson.

Field Work Assignment

You will complete 15 hours of field work and keep a log of these hours for submission at the end of the semester. During this time, you will remain with one teacher and slowly begin to interact with students. By the end of the experience you will have taught a whole, or part of a whole, lesson. You will submit the lesson and reflect upon its effectiveness. This assignment provides you with an excellent opportunity to work with real students as you prepare to become a teacher.

Communication

You must regularly check your GMU email and Blackboard: <https://courses.gmu.edu>.

Evaluation

Final course grades will be assigned based upon weighted percentages as indicated by the Course Expectations.

| | |
|----|-----------|
| A | 93-100% |
| A- | 90-92% |
| B+ | 88-89% |
| B | 80-87% |
| C | 70-79% |
| F | Below 70% |

Student Expectations (as described by the College of Education and Human Development)

- Students must adhere to the guidelines of the George Mason University Honor Code [See <http://academicintegrity.gmu.edu/honorcode/>].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See <http://ods.gmu.edu/>].
- Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/1301gen.html>].
- Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

Campus Resources

- The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See <http://caps.gmu.edu/>].
- The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See <http://writingcenter.gmu.edu/>].
- For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See <http://gse.gmu.edu/>].

College Expectations

The College expects students to exhibit the following Professional Dispositions:

Commitment to the profession

Promoting exemplary practice
 Excellence in teaching and learning
 Advancing the profession
 Engagement in partnerships

Commitment to honoring professional ethical standards

Fairness
 Honesty
 Integrity
 Trustworthiness
 Confidentiality
 Respect for colleagues and students

Commitment to key elements of professional practice

Belief that all individuals have the potential for growth and learning
 Persistence in helping individuals succeed
 High standards
 Safe and supportive learning environments
 Systematic planning
 Intrinsic motivation
 Reciprocal, active learning
 Continuous, integrated assessment
 Critical thinking
 Thoughtful, responsive listening
 Active, supportive interactions
 Technology-supported learning
 Research-based practice
 Respect for diverse talents, abilities, and perspectives
 Authentic and relevant learning

Commitment to being a member of a learning community

Professional dialogue
 Self-improvement
 Collective improvement
 Reflective practice
 Responsibility
 Flexibility
 Collaboration
 Continuous, lifelong learning

Commitment to democratic values and social justice

Understanding systemic issues that prevent full participation
 Awareness of practices that sustain unequal treatment or unequal voice
 Advocate for practices that promote equity and access
 Respects the opinion and dignity of others
 Sensitive to community and cultural norms
 Appreciates and integrates multiple perspectives

Tentative Schedule

The dates are subject to change dependent on the progress of the course. Due dates for major assignments will not be moved to an earlier date, only a later date if necessary.

| Date | Topic | Text | Major Assignment Due |
|-----------------|---|---|--|
| Aug. 29 | The Big Picture: Course Goals and Unit Planning | Brahier (2009): Chapter 6 pp. 136-141 | |
| Sept. 5 | Managing Discourse | HO: Discourse That Promotes Conceptual Understanding HO: "It's Hard Getting Kids to Talk About Math": Helping New Teachers Improve Mathematical Discourse | Idea for Unit Plan |
| Sept. 12 | Questioning and Reflection | HO: The Importance, Nature and Impact of Teacher Questions HO: Questioning the Questions HO: Questioning Our Patterns of Questioning | |
| Sept. 19 | Differentiation | Brahier (2009): Chapter 11 Dodge Chapter 1,2 All | |
| Sept. 26 | Differentiation/Diversity | <u>Teacher Experts</u> Dodge Chapter 3-7 HO: Mathematics Instruction and Academic English: Adapting Problems for Varying English Proficiencies HO: Building Responsibility for Learning in Students with Special Needs HO: Mathematically Gifted in the Heterogeneously Grouped Mathematics Classroom: What is a Teacher to Do? | Draft Unit Overview and Outline Due |
| Oct. 3 | Assessment | Brahier (2009): Chapter 9 pp. 260-270 Brahier (2009) Chapter 10 pp. 296-303 Brahier (2001): Chapter 1 | |
| Oct. 10 | Assessment | Brahier (2009): Chapter 10 pp. 303-315 Brahier (2001): Chapters 2 and 3 | |
| Oct. 17 | Assessment | Brahier (2001): Chapters 4 and 5 | |
| Oct. 24 | MicroTeach (3) | | Draft Assessment for Unit Plan due |
| Oct. 31 | MicroTeach (2) | | Drafts of 2 (Minimum) Lesson Plans Due |
| Nov. 7 | MicroTeach (2) | | |
| Nov. 14 | MicroTeach (2) | | Unit Plan due |
| Nov. 21 | Fall Break | | |
| Nov. 28 | Teacher in the Community/Behavior Management | Brahier (2009): Chapter 12 | Assessment Plan due |
| Dec. 5 | Final Unit Plan Presentations | Informal Presentation of Unit Plan lesson idea | Field Work Assignment Due |
| Dec. 12 | Final Exam Day | Informal Presentation of Unit Plan lesson idea (<i>Final Exam time: 4:30-7:15 pm</i>) | |