GEORGE MASON UNIVERSITY  
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT  
Graduate School of Education

Advanced Mathematics Methods for the Elementary Classroom  
EDCI 633 001 (3 credits)  
Spring, 2010  
(Requirement for Elementary Education Program, M.Ed. Component)

Instructor:  Dr. Christopher J. Johnston  
Home Phone:  (703) 256-7646  
Office:  Commerce II, 207  
Class Meets:  Wednesdays, 4:30 – 7:10 p.m.  
Location:  Robinson A, 106  
Email:  cjohnst2@gmu.edu  
Office Hours:  Wednesdays, 11:00 a.m. – 1:00 p.m.  
Also by appointment

I. Course Description

Focuses on teaching all children, including those from non-mainstreamed populations, problem solving and higher order thinking skills based on state and national mathematics standards. A variety of techniques and materials are used to develop problem-solving strategies and promote better understanding of various mathematical concepts. Students read, interpret, and critique mathematics education research and examine its applications in classrooms.  
Prerequisite: Completion of the Elementary Education Licensure Program and EDCI 552 or Permission of the Instructor.

II. Student Outcomes

At the conclusion of this course, students should be able to:  
A. Demonstrate problem-solving strategies in various mathematical content areas and have a better understanding of concepts in mathematics.  
B. Articulate methodologies for teaching mathematics more effectively to children with various abilities in Grades K-6; Plan effective mathematics instruction for students from diverse populations with a variety of learning needs.  
C. Know how to more effectively teach a standards-based mathematics curriculum using NCTM’s Principles and Standards for School Mathematics and the Virginia Standards of Learning.  
D. Collect and analyze mathematics data from students in a classroom; Use technology to present the data in various graphical formats.  
E. Cite national and international studies that impact how mathematics is taught in classrooms.  
F. Read, interpret, and critique mathematics education research on teaching and learning and examine its applications in classrooms.

III. Relationship to Program Goals and Professional Organizations

EDCI 633 is designed to enable classroom teachers to read, interpret, and evaluate critical issues in mathematics education research that impact their own mathematics teaching and learning. The course was developed according to the National Council of Teachers of Mathematics content and process standards.
### Student Outcomes Referenced to Selected National Standards

<table>
<thead>
<tr>
<th>Course Student Outcomes (above)</th>
<th>NCTM Principles and Standards</th>
<th>INTASC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S1-10, P1-6</td>
<td>S1</td>
</tr>
<tr>
<td>B</td>
<td>S1-10, P1-6</td>
<td>S1, S2, S8</td>
</tr>
<tr>
<td>C</td>
<td>P6</td>
<td>S6</td>
</tr>
<tr>
<td>D</td>
<td>S6, P6</td>
<td>S2, S3, S4, S5</td>
</tr>
<tr>
<td>E</td>
<td>S1-10</td>
<td>S1</td>
</tr>
<tr>
<td>G</td>
<td>S1-10, P1-6</td>
<td>S1, S9, S10</td>
</tr>
</tbody>
</table>

Key:
INTASC = Standards for Beginning Teachers, where S = standards.

### IV. Nature of Course Delivery

The delivery of this course combines methods of lecture, discussion, independent study/research, student presentation, mathematical problem solving, online meetings, online postings, and writing. Access to Blackboard and GMU email are required to participate successfully in this course.

### V. Texts and Readings

**Text:** (Available at the GMU Bookstore)


**Articles:** (NCTM Membership Required)*


*You may use your school’s Institutional Membership, or you may purchase the student e-membership from NCTM at: [http://www.nctm.org/membership/content.aspx?id=7618](http://www.nctm.org/membership/content.aspx?id=7618) for $39. Alternatively, print journals may be available at the GMU Fenwick Library.*
VI. Course Requirements and Assignments

The assignments across the semester are intended to improve your strategies as a mathematics teacher and to develop your skills in the interpretation, critique and synthesis of mathematics education research. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues. Late assignments will be worth a lower grade.

A. Research Synopsis Assignment (10%)

Synopsis – “A brief statement or outline of a subject; similar to an abstract.”
A synopsis should be 3–4 pages in length, 12 pt font, double-spaced. APA formatting, grammar, spelling, and the other mechanics of writing will be considered part of your grade.

In this assignment you will write a synopsis of one mathematics education research articles from different types of resource materials. You will make an informal presentation to the class about the information in the article. The SYNOPSIS should include the following items in this order: (1) APA Citation of the Article, (2) Research Question, (3) Participants, (4) Procedures/Data Collection Methods, (5) Analysis, (6) Results, and (7) Impact/Connections.

Select a mathematics article from the *Journal for Research in Mathematics Education* or *Educational Studies in Mathematics*, two of the top research journals in mathematics education. Alternatively, you may use a journal from either *School Science and Mathematics*, or *Educational Studies in Mathematics*.

B. Student Data and Power Point Assignment (40%) - PBA

In this assignment, you will collect and analyze mathematics data from the students in a classroom and use technology to present the data in various graphical formats. The data that are collected must include (1) students’ written or verbal explanations with students’ drawings showing a conceptual or process approach to the mathematics, and (2) students computations or symbolic expressions of mathematics content showing a procedural approach.

- Collect both forms of mathematics data from at least 10 students.
- Use various methodological strategies to analyze and synthesize the data.
- Create a written analysis of the data with at least three graphs. Write this analysis in the form of a research report that includes: Participants, Data Collection Methods, Data Analysis Methods, Written Descriptive Results, and Graphic Presentation of the Results.
- Use Power Point to create a Visual Presentation of the Data/Student work that includes: Participants, Data Collection Methods, Data Analysis Methods, Written Descriptive Results, and Graphic Presentation of the Results.

C. Evaluation of Technology Tools for Mathematical Learning (10%)

Via a Zoomerang Survey tool, you will: (a) identify your criteria for evaluating technology tools; (b) rank pre-selected criteria for evaluating technology tools; and (c) evaluate four pre-selected technology tools. You will be evaluated based on the depth of your reflections and thoroughness of the evaluations.

D. Mathematics Problem Solving Tasks and Presentation (10%)

During class sessions throughout the semester, students will engage in problem-solving activities from different areas of mathematical content. Students will solve a variety of problems, write and explanation for their solutions, and share and discuss various solutions with colleagues. Initial problems will be chosen and presented by the instructor. During the second half of the course, student groups will select one problem to prepare and present to the class. Problems selected should incorporate the exploration of rich mathematics content; the presentation must incorporate multiple solution strategies as well as
techniques for assisting and supporting diverse learners. These problems are designed to strengthen
students’ mathematics content knowledge and improve students’ instructional strategies and techniques.

E. Midterm (20%)

During the first half of the semester, students will be engaged in problem solving activities which will
depth their understanding of the five NCTM Content Standards: Number and Operations, Geometry,
Measurement, Algebra, and Data Analysis & Probability. The midterm will include problems similar to
those explored in class. The focus of the problems will be: using multiple representations to solve the
problems, taking into account student misconceptions and understandings of the problems, and reflecting
upon one’s own problem-solving process.

F. Attendance & Participation (5%)

During each class session, students are expected to attend class and arrive on time. Exceptions (due to
extreme circumstances) must be discussed with the instructor.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>LEVEL of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance &amp;</td>
<td>Distinguished</td>
</tr>
<tr>
<td>Participation</td>
<td>(4 – 5 points)</td>
</tr>
<tr>
<td></td>
<td>Proficient</td>
</tr>
<tr>
<td></td>
<td>(3 points)</td>
</tr>
<tr>
<td></td>
<td>Basic</td>
</tr>
<tr>
<td></td>
<td>(2 points)</td>
</tr>
<tr>
<td></td>
<td>Unsatisfactory</td>
</tr>
<tr>
<td></td>
<td>(1 or 0 points)</td>
</tr>
</tbody>
</table>

- Attendance & Participation
  - The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence. The student actively participates and supports the members of the learning group and the members of the class.
  - The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence; the student makes active contributions to the learning group and class.
  - The student is on time, prepared for class, and participates in group and class discussions. The student attends all classes and if an absence occurs, the procedure outlined in this section of the syllabus is followed.
  - The student is late for class. Absences are not documented by following the procedures outlined in this section of the syllabus. The student is not prepared for class and does not actively participate in discussions.

G. Online Posting – Lesson Plans (5%)

During the online posting (Week 10), students will share lesson plans and teaching ideas from their
classrooms. See course schedule for online class meeting date.

VII. Evaluation Schema

Determination of the Final Grade:

<table>
<thead>
<tr>
<th>Graduate Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  93%-100%</td>
</tr>
<tr>
<td>B+ 87%-89%</td>
</tr>
<tr>
<td>C  70%-79%</td>
</tr>
<tr>
<td>A- 90%-92%</td>
</tr>
<tr>
<td>B  80%-86%</td>
</tr>
<tr>
<td>F  Below 70%</td>
</tr>
</tbody>
</table>
UNIVERSITY POLICIES

The university has a policy that requests students to turn off pagers and cell phones before class begins.

The Graduate School of Education (GSE) expects that all students abide by the following:

HONOR CODE
To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University and with the desire for greater academic and personal achievement, George Mason University has set forth a code of honor that includes policies on cheating and attempted cheating, plagiarism, lying and stealing. Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#TOC_H12 for the full honor code.

INDIVIDUALS WITH DISABILITIES POLICY
The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

ATTENDANCE POLICY
Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus (GMU University Catalog, pg. 32).

PROFESSIONAL BEHAVIOR & DISPOSITIONS
Students are expected to exhibit professional behavior and dispositions. See www.gse.gmu.edu for a listing of these dispositions.

Students must agree to abide by the university policy for Responsible Use of Computing. See http://mail.gmu.edu and click on Responsible Use of Computing at the bottom of the screen.

Syllabus revised 1/4/10.

PROPOSED COURSE SCHEDULE

See separate schedule, distributed the first night of class. Please note that this schedule is subject to change, based on the needs of the students, as well as inclement weather. Any changes to the course schedule will be posted on Blackboard.
<table>
<thead>
<tr>
<th>Session #</th>
<th>Date</th>
<th>Topic/Learning Experiences</th>
<th>Readings &amp; Assignments due at this class session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wednesday, January 20, 2010</td>
<td>Beliefs about Mathematics Looking at Mathematics Teaching and Learning: State of the Union Introduce Student Data Assignment</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wednesday, January 27</td>
<td>ONLINE MEETING (synchronous) Assessment in Mathematics Online Learning/Explore Chat Meet with Groups</td>
<td>Nitko Chapter (section on rubrics) – posted on Blackboard See Class 2 Folder (Blackboard) for Instructions</td>
</tr>
<tr>
<td>5</td>
<td>Wednesday, February 17</td>
<td>ONLINE MEETING (synchronous) Evaluation of Technology Tools</td>
<td>Synopsis Assignment DUE</td>
</tr>
<tr>
<td>7</td>
<td>Wednesday, March 3, 2010</td>
<td>Midterm Consultations with Instructor: Student Data Assignment (Note location TBA)</td>
<td>Study for Midterm</td>
</tr>
<tr>
<td></td>
<td>Wednesday, March 10, 2010</td>
<td>GMU SPRING BREAK – NO CLASS</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Wednesday, March 17, 2010</td>
<td>Subtraction with Regrouping: Approaches to Teaching a Topic</td>
<td>Ma: Chapter 1 Problem Presentation Due – Groups 1&amp; 2</td>
</tr>
<tr>
<td>9</td>
<td>Wednesday, March 24, 2010</td>
<td>Multidigit Number Multiplication: Dealing with Students’ Mistakes</td>
<td>Ma: Chapter 2 Problem Presentation Due – Groups 3 &amp; 4</td>
</tr>
<tr>
<td>10</td>
<td>Wednesday, March 31, 2010</td>
<td>ONLINE ASSIGNMENT (asynchronous) Share Lesson Plans and Ideas from Teaching</td>
<td>Lesson Plan Posted on Blackboard no later than today (may complete prior to this date) [The actual requirements are posted on Blackboard.]</td>
</tr>
<tr>
<td>11</td>
<td>Wednesday, April 7, 2010</td>
<td>Generating Representations: Division by Fractions</td>
<td>Ma: Chapter 3 Problem Presentation Due – Groups 5* &amp; 6* (as needed)</td>
</tr>
<tr>
<td>12</td>
<td>Wednesday, April 14, 2010</td>
<td>ONLINE MEETING (synchronous) Student Data Assignment</td>
<td>Share drafts of your written report with members of your group</td>
</tr>
<tr>
<td>13</td>
<td>Wednesday, April 21, 2010</td>
<td>Exploring New Knowledge: The Relationship Between Perimeter and Area</td>
<td>Ma: Chapter 4 Student Data and Poster Assignment – Written Analysis DUE</td>
</tr>
<tr>
<td>14</td>
<td>Wednesday, April 28, 2010</td>
<td>ONLINE MEETING (synchronous) Teachers’ Subject Matter Knowledge: Profound Understanding of Fundamental Mathematics: When and How Is It Attained?</td>
<td>Ma: Chapters 5, 6 &amp; 7</td>
</tr>
<tr>
<td>15</td>
<td>Wednesday, May 5, 2010</td>
<td>Gallery Walk – PowerPoints Course Evaluation (Note: Location TBA – likely computer lab) Survey: EDCI 633 Face-to-Face/Online Experience</td>
<td>Student Data and Poster Assignment – PowerPoint Presentations DUE</td>
</tr>
</tbody>
</table>

Updated 1/7/10