Advanced Mathematics Methods for the Elementary Classroom
EDCI 633 001 (3 credits)
Fall 2005

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Office Hours: 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>P1, P2, P7</td>
</tr>
<tr>
<td>B</td>
<td>S1-10, P1-6</td>
<td>P1, P2, P7</td>
</tr>
<tr>
<td>C</td>
<td>S1-10, P1-6</td>
<td>P1, P2, P, P8</td>
</tr>
<tr>
<td>D</td>
<td>S5, P6</td>
<td>P1, P2, P6, P8, P9</td>
</tr>
<tr>
<td>E</td>
<td>P1-6</td>
<td>P1, P6</td>
</tr>
<tr>
<td>F</td>
<td>P3-4</td>
<td>P1, P6, P9</td>
</tr>
</tbody>
</table>

Key:
INTASC = Standards for Beginning Teachers, where P = principles

IV. Nature of Course Delivery

The delivery of this course combines methods of lecture, discussion, independent study/research, student presentation, mathematical problem solving, and writing.

V. Texts and Readings

BOOK


ONLINE RESOURCE:
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.

A. Research Synopsis Assignments (20%)

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.

In this assignment you will write a synopsis of two mathematics education research articles from two different types of resource materials. You will make an informal presentation to the class about the information in the article.
Each 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.

Synopsis #1 – Select a mathematics article from *Teaching Children Mathematics*, the elementary journal of the National Council of Teachers of Mathematics.
Synopsis #2 – 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.

B. Student Data and Poster Assignment (40%)

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 poster board to create a Poster 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. “From the Classroom” Lesson & Paper (15%)

You will write a paper about techniques, strategies or insights about teaching mathematics. The article will include a description of classroom context and a rich description of students, learning, teaching and the thoughtful reflection on the issue. This paper will follow the manuscript format from the journal *Teaching Children Mathematics*. See [http://my.nctm.org/eresources/view_media.asp?article_id=6719](http://my.nctm.org/eresources/view_media.asp?article_id=6719)
D. Mathematics Problem Solving Tasks and Presentation (15%)
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 explain 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. Discussion & Response Record (10%)
During each class session, students participate in activities that are documented as a record of their individual contributions to the class. Students are evaluated on these contributions. The following activities are included in the Response Record for the class: (1) Students will be randomly selected to provide an overview of key points in the readings during class discussions, (2) Students will be randomly selected to discuss their Research Synopsis Assignments on the dates these assignments are due, (3) Students will share lesson plans and teaching ideas from their classrooms.

VII. Evaluation Schema

Determination of the Final Grade:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93%-100%</td>
</tr>
<tr>
<td>A-</td>
<td>90%-92%</td>
</tr>
<tr>
<td>B+</td>
<td>87%-89%</td>
</tr>
<tr>
<td>B</td>
<td>80%-86%</td>
</tr>
<tr>
<td>C</td>
<td>70%-79%</td>
</tr>
<tr>
<td>F</td>
<td>Below 70%</td>
</tr>
<tr>
<td>Session</td>
<td>Topic/Learning Experiences</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
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<tr>
<td>Tuesday, August 30</td>
<td>Beliefs about Mathematics Looking at Mathematics Teaching and Learning: State of the Union</td>
</tr>
<tr>
<td>Tuesday, September 6</td>
<td>Critical Features of Classrooms The Role of the Teacher</td>
</tr>
<tr>
<td>Tuesday, September 13</td>
<td>The Social Culture of the Classroom Mathematical Tools as Learning Supports (Introduction to Virtual Manipulatives) Equity and Accessibility Share synopsis</td>
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<tr>
<td>Tuesday, September 20</td>
<td>Cognitively Guided Instruction Conceptually Based Instruction</td>
</tr>
<tr>
<td>Tuesday, September 27</td>
<td>Student Talk in a Problem-Centered Classroom Snapshots Across Two Years in the Life of an Urban Latino Classroom</td>
</tr>
<tr>
<td>Tuesday, October 4</td>
<td>Revisiting the Critical Features of Classrooms Strands of Mathematical Proficiency Share synopsis</td>
</tr>
<tr>
<td>Tuesday, October 11</td>
<td>NO CLASS: Monday classes meet on Tuesday due to Columbus Day Holiday</td>
</tr>
<tr>
<td>Tuesday, October 18</td>
<td>Subtraction with Regrouping: Approaches to Teaching a Topic</td>
</tr>
<tr>
<td>Tuesday, Oct. 25</td>
<td>Multidigit Number Multiplication: Dealing with Students’ Mistakes</td>
</tr>
<tr>
<td>Tuesday, Nov. 1</td>
<td>Generating Representations: Division by Fractions</td>
</tr>
<tr>
<td>Tuesday, Nov. 8</td>
<td>Exploring New Knowledge: The Relationship Between Perimeter and Area</td>
</tr>
<tr>
<td>Tuesday, Nov. 15</td>
<td>Teachers’ Subject Matter Knowledge: Profound Understanding of Fundamental Mathematics</td>
</tr>
<tr>
<td>Tuesday, Nov. 22</td>
<td>Profound Understanding of Fundamental Mathematics: When and How Is It Attained?</td>
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</tbody>
</table>
1) Student Data and Poster Assignment – Poster Presentations DUE

Tuesday, Dec. 6
Presentations

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.