I. Course Description

An introduction to methods for teaching all children including those from non-mainstreamed populations developmentally appropriate topics in arithmetic, geometry, algebra, probability and statistics. This is a hands-on, activity, workshop-oriented experience. Students work with manipulatives and technologies to explore mathematics, solve problems, and learn ways to teach mathematics content to children. Field experience is required.

Prerequisite: Admission to the Elementary Education Licensure Program

II. Student Outcomes

This course will enable students to:

A. Know what constitutes the essential topics in mathematics of the modern early and intermediate grades school program.

B. Identify and use selected manipulatives and technology such as Linking Cubes, Attribute Blocks, Geoboards, Base-10 Blocks, Fraction Circles, Tangrams, calculators, and computers to teach appropriate mathematics content topics in the early and middle grades.

C. Identify and use various instructional strategies and techniques (cooperative and peer group learning, activity centers, laboratories and workshops, teacher-directed presentations, etc.) to teach mathematical content topics appropriate for the early and intermediate grades to all children including those from non-mainstreamed populations.

D. Identify and use alternative methods for assessing students’ work in mathematics in the early and intermediate grades.

E. Solve problems in the mathematical content areas of logic, number theory, geometry, algebra, probability, and statistics appropriate for adaptation to the early and intermediate grades.

F. Know and explain what is a standards-based mathematics curriculum, what are the key elements of the National Council of Teachers of Mathematics Principles and Standards for School Mathematics, and what are the key elements of the Virginia Standards of Learning for Mathematics.

III. Relationship to Program Goals and Professional Organizations

Student Outcomes Referenced to Selected National Standards

<table>
<thead>
<tr>
<th>Course Student Outcomes (above)</th>
<th>NCTM Principles and Standards</th>
<th>ISTE NETS</th>
<th>INTASC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S1, S2, S3, S4, S5</td>
<td>SI</td>
<td>P1, P7</td>
</tr>
<tr>
<td>B</td>
<td>S10</td>
<td>SII</td>
<td>P1, P2, P6</td>
</tr>
<tr>
<td>C</td>
<td>P1, P2, P3, P4, P6</td>
<td>SII</td>
<td>P1, P2, P3, P4</td>
</tr>
<tr>
<td>D</td>
<td>P5</td>
<td>SIV</td>
<td>P3, P8</td>
</tr>
<tr>
<td>E</td>
<td>S1, S2, S3, S5, S6</td>
<td>SI</td>
<td>P4, P6</td>
</tr>
<tr>
<td>F</td>
<td>S1-10, P1-6</td>
<td>SI</td>
<td>P1, P7, P9</td>
</tr>
</tbody>
</table>

Key:
ISTE NETS = International Society for Technology in Education National Education Technology Standards 2000, where S = standard number
INTASC = Standards for Licensing Beginning Teachers, where P = principles
IV. Nature of Course Delivery
In this course we will begin an inquiry into mathematics teaching and learning that will guide you in your first teaching job and give you the tools that will enable you to continue to inquire and learn as part of your work as a teacher. Class sessions will be interactive and will include a variety of hands-on experiences with concrete and virtual manipulatives appropriate for elementary school mathematics. We will explore the teaching of mathematics, investigating both what to teach and how to teach it. We will explore what it means to do mathematics and what it means to understand mathematics through individual, small group, and large group mathematical problem solving. We will investigate ways to represent understandings of mathematical concepts, communicate reasoning about mathematical ideas, and construct mathematical arguments. We will investigate and read about ways children might represent mathematical concepts, looking at ways to help children build connections and see relationships among mathematical ideas. We will explore characteristics of a classroom environment conducive to mathematical learning by reading and discussing the importance of mathematical tasks, mathematical tools, the roles of teachers and students, and the assessment of mathematical understanding.

V. Required Texts & Readings
NCTM Student Membership. Provides access to (1) Online subscription to *Teaching Children Mathematics* (for the elementary grades), and online NCTM 2000 *Principals and Standards for School Mathematics*; available from the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091; 703-620-9840; www.nctm.org website.

VI. Course Requirements and Assignments
The assignments across the semester are intended to further your understandings of what it means to teach, learn, and assess mathematics in light of current reforms in mathematics education. All assignments are to be turned in to your instructor on time. LATE ASSIGNMENTS: Late work will not be accepted for full credit. If the student makes prior arrangements with the instructor, assignments turned in late will receive a 10% deduction from the grade per late day or any fraction thereof (including weekends and holidays).

- Mathematics Content Exam #1 (20%)
- Mathematics Content Exam #2 (10%)
- Mathematics Content Exam #3 (20%)
- Error Patterns in Computation Exam #2 (10%)
- Student Assessment Interview (20%)
- Lesson Plan Summary Report (20%)
- Presentation & Participation Assignments (10%)

> 50% Mathematics Content
> 50% Mathematics Pedagogy

A. Exams (50%)
The two mathematics Content Exams (June 7 & Dec. 20) in this course will consist primarily of multiple choice and short response questions that focus on mathematics content in the elementary grades, with some questions focusing on methodological content. Throughout the semester, brief content-specific homework assignments will assist you in reviewing important mathematics appropriate for the elementary grades. The Error Patterns Exam (Nov. 8) will focus on your ability to identify children’s errors in computation for the purpose of improving mathematics instruction. If you must be absent from a scheduled exam (with instructor approval), you must contact the instructor personally, prior to the exam, to make alternative arrangements to take the exam.
B. Student Assessment Interview (20%) – Performance Based Assessment for the Course

In order to plan effective instruction, you will need to know how to assess children’s knowledge of mathematical concepts. One way to assess children’s thinking is a diagnostic interview. This assignment has two parts: (1) Design a plan for the interview, assessing a specific mathematics topic using concrete, pictorial and abstract representations, (2) Conduct the interview with a child and write a report describing the outcome of the interview. (5% PLAN due – Sept. 20; 15% REPORT due – Nov. 22)

C. Three Lesson Plan Summaries (20%)

You are required to plan, teach, and complete a formal summary for 3 mathematics lessons during your field placement (SUMMARIES due – Oct. 4, Oct. 25, Dec. 6). The format for designing your mathematics lessons is found in your PDS Manual. Try to avoid the overuse of worksheets. Integrate the use of mathematics tools (manipulatives, calculators, computers) and representations (concrete, pictorial, symbolic) to provide children with an interactive, conceptually-based mathematics experience. The lesson plan summaries are a three-phase process: (1) Design the lesson plan, (2) Teach the lesson in your classroom, and (3) Collect and report evidence of student learning from the lesson.

- One of the lessons must include the documentation from a formal observation of the lesson by a classroom teacher or university facilitator (Formal Observation Report Form in PDS Manual). This document will be used to grade your teaching. (Formal Observation Report due Dec. 6)

D. Presentation & Participation Assignments (10%)

A variety of presentation, field experience, and participation activities will be integrated into our class sessions this semester. You will discuss and receive feedback on your mathematics teaching using a Lesson Reflection Procedure in class. You will share ideas on student error patterns and technology in brief presentations during class sessions. You will participate in class activities such as measurement centers during class time. These assignments require your active engagement in class sessions; therefore, there is no opportunity to “make-up” these assignments.

Attendance. It is your responsibility to attend all class sessions. You are held accountable for all information from each class session whether you are present or not. Please report your reasons for any absences to the instructor in writing. Tardiness. It is your responsibility to be on time for each class session. Please report your reasons for any tardiness to the instructor in writing.

VII. Evaluation Schema

Determination of the Final Grade:

Graduate Grading Scale

A  93%-100%  B+  87%-89%  C  70%-79%
A-  90%-92%  B  80%-86%  F  Below 70%

The mathematics education courses in GSE’s Elementary Education Program integrate pedagogy and mathematics content appropriate for the elementary school grades. For students to earn a grade of A in the course, they must demonstrate excellence in both the pedagogical knowledge and the content knowledge of the mathematics appropriate at their level of teaching. Thus, the grading in the course is structured to help evaluate fairly student excellence in both areas. Exam work focuses primarily on ascertaining student excellence in handling mathematics content appropriate for the elementary grades, and represents 50% of students’ grades. Pedagogical knowledge is ascertained primarily from readings, assignments and participation in the course, and represents 50% of students’ grades. Therefore students who demonstrate excellence in both pedagogical knowledge and content knowledge receive grades of A.
## IX. Course Schedule

### SUMMER/FALL 2005 CALENDAR

#### CLASS SCHEDULE

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic/Learning Experiences</th>
<th>Readings &amp; Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUMMER</strong></td>
<td>9:30 AM - 2:15 PM</td>
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</tr>
<tr>
<td>Tuesday, May 24</td>
<td>What is Mathematics? How Do Children Learn Mathematics? NCTM’s Principles &amp; Standards 2000 Planning for Mathematics Instruction</td>
<td>REYS: Chapters 1, 2, &amp; 3 ASHLOCK: Chapter 1 RIDENER: Chapters 1, 2 &amp; 12</td>
</tr>
<tr>
<td>Tuesday, May 31</td>
<td>Assessment – Conducting a Diagnostic Interview Number Sense, Counting, &amp; Patterns</td>
<td>REYS: Chapters 4, 7 &amp; 14 ASHLOCK: Chapter 2 RIDENER: Chapters 3 &amp; 6</td>
</tr>
<tr>
<td>Tuesday, June 7</td>
<td>Mathematical Processes &amp; Problem Solving Number Sense &amp; Place Value Integrating Technology &amp; Virtual Manipulatives</td>
<td>REYS: Chapters 5, 6 &amp; 8 ASHLOCK: Chapter 3 RIDENER: Chapters 3, 6 &amp; 10 <strong>CONTENT EXAM #1</strong></td>
</tr>
<tr>
<td><strong>FALL</strong></td>
<td>1:00 – 4:00 PM</td>
<td></td>
</tr>
<tr>
<td>Tuesday, Sept. 6 (2:15-4PM)</td>
<td>Basic Facts &amp; Whole Number Operations Designing Mathematics Lessons</td>
<td>REYS: Chapters 8, 9, 10 &amp; 11 ASHLOCK: Chapter 4 (present) RIDENER: Chapter 4</td>
</tr>
<tr>
<td>Tuesday, Sept. 20</td>
<td>Basic Facts &amp; Whole Number Operations Technology &amp; Virtual Manipulatives</td>
<td>REYS: Chapters 8, 9, 10 &amp; 11 ASHLOCK: Chapter 5 (present) RIDENER: Chapter 4 <strong>Student Assess Interview PLAN DUE</strong></td>
</tr>
<tr>
<td>Tuesday, Oct. 4</td>
<td>Fractions, Decimals, &amp; Percent How to ask questions/interviewing a child</td>
<td>REYS: Chapters 12 &amp; 13 ASHLOCK: Chapters 6 &amp; 7 (present) RIDENER: Chapter 5 <strong>Lesson Plan Summary #1 DUE</strong></td>
</tr>
<tr>
<td>Tuesday, Oct. 25</td>
<td>Fractions, Decimals, &amp; Percent</td>
<td>ASHLOCK: Chapters 8 &amp; 9 (present) RIDENER: Chapter 5 <strong>Lesson Plan Summary #2 DUE</strong></td>
</tr>
<tr>
<td>Tuesday, Nov. 8</td>
<td>Geometry &amp; Measurement</td>
<td>REYS: Chapter 15 &amp; 16 ASHLOCK: Chapter 10 RIDENER: Chapters 7 &amp; 8 <strong>Error Patterns EXAM #2</strong></td>
</tr>
<tr>
<td>Tuesday, Nov. 22</td>
<td>Geometry &amp; Measurement</td>
<td>REYS: Chapter 15 &amp; 16 ASHLOCK: Chapter 10 RIDENER: Chapters 7 &amp; 8 <strong>Student Assess Interview REPORT DUE</strong></td>
</tr>
<tr>
<td>Tuesday, Dec. 6</td>
<td>Data Analysis, Statistics, &amp; Probability Algebraic Thinking</td>
<td>REYS: Chapters 14 &amp; 17 RIDENER: Chapters 6 &amp; 9 <strong>Lesson Plan Summary #3 DUE</strong> <strong>Formal Observation Report DUE</strong></td>
</tr>
<tr>
<td>Tuesday, Dec. 20</td>
<td>Last day of classes is Dec. 10th Final Exam Week Dec. 12-20</td>
<td><strong>CONTENT EXAM #3</strong></td>
</tr>
</tbody>
</table>
X. UNIVERSITY POLICIES

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

The College of Education and Human Development (CEHD) 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.

Approved March 2004